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2ND EDITION

PARMAR SSC FATMAN

GK/GS THEORY BOOK

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ENGLISH MEDIUM

WHO IS THIS BOOK FOR?

FOR THE RESTLESS MINDS PREPARING FOR:

SSC CGL (TIER 1 & 2) | CHSL (TIER 1 & 2) | CPO | MTS | STENO | SELECTION POST | JE | GD | DEFENCE | RAILWAY | PCS | STATE POLICE & ALL OTHER ONE DAY COMPETITIVE EXAMINATION

WHY FATMAN 2nd EDITION IS A MUST-HAVE?

- Updated Exam-Specific Content.
- Designed To Build Strong Conceptual Clarity.
- Clear, Logical Structure for Easy Learning & Fast Revision.
- Powered by Concepts, Backed by Memes, Designed to Make You Smile While You Learn.

SSC GK = PARMAR SSC

BY PARMAR SIR

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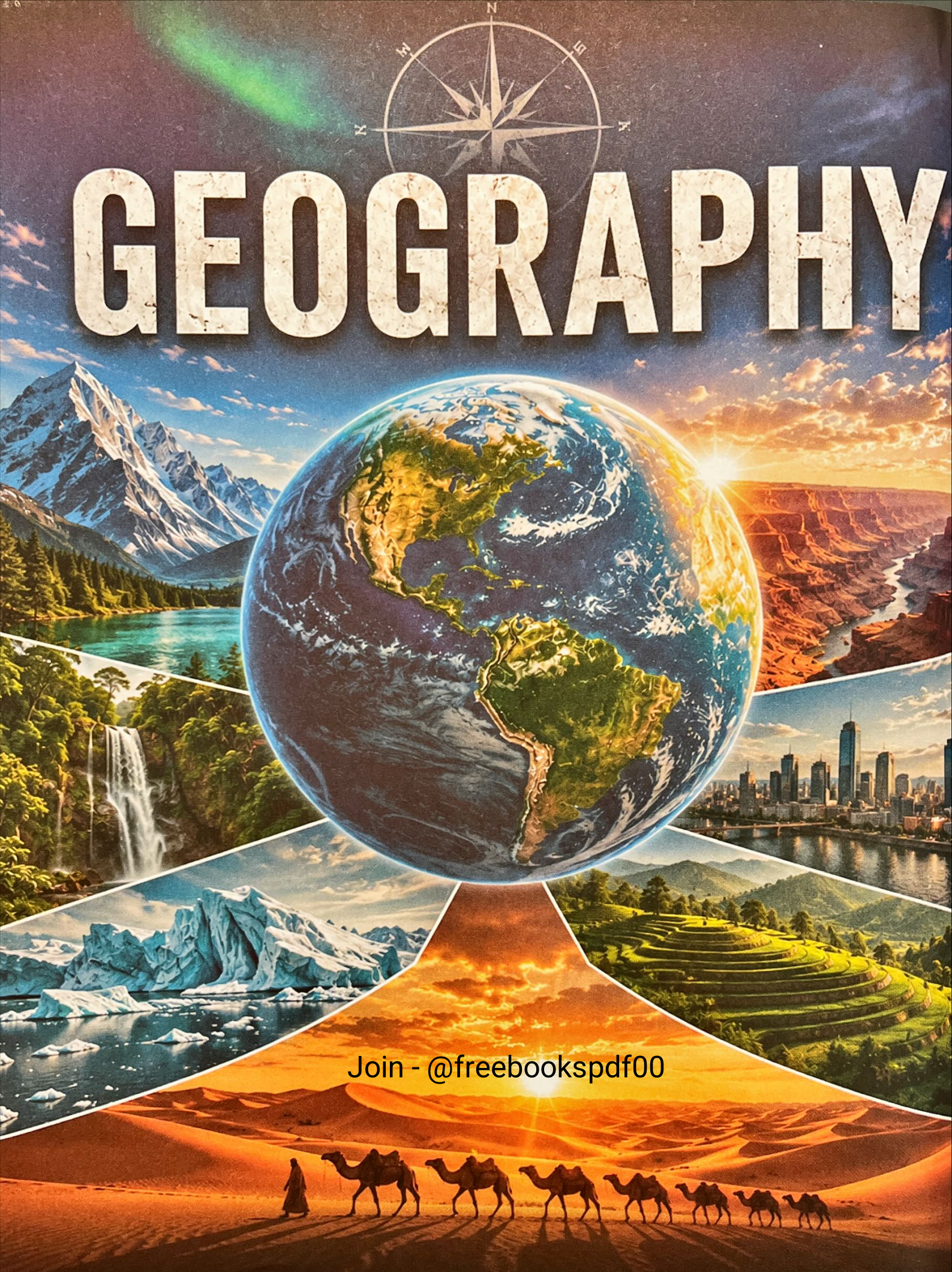

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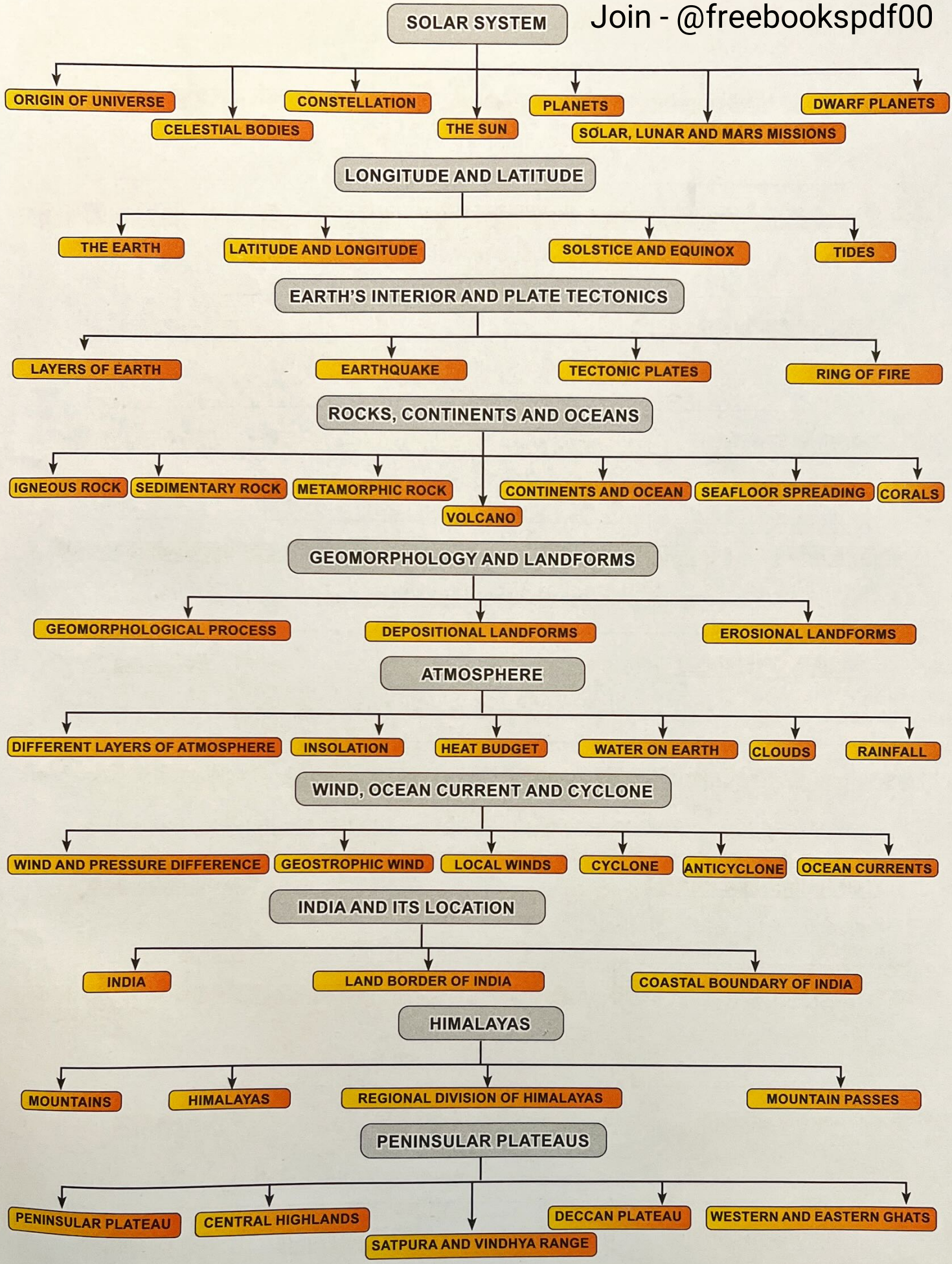

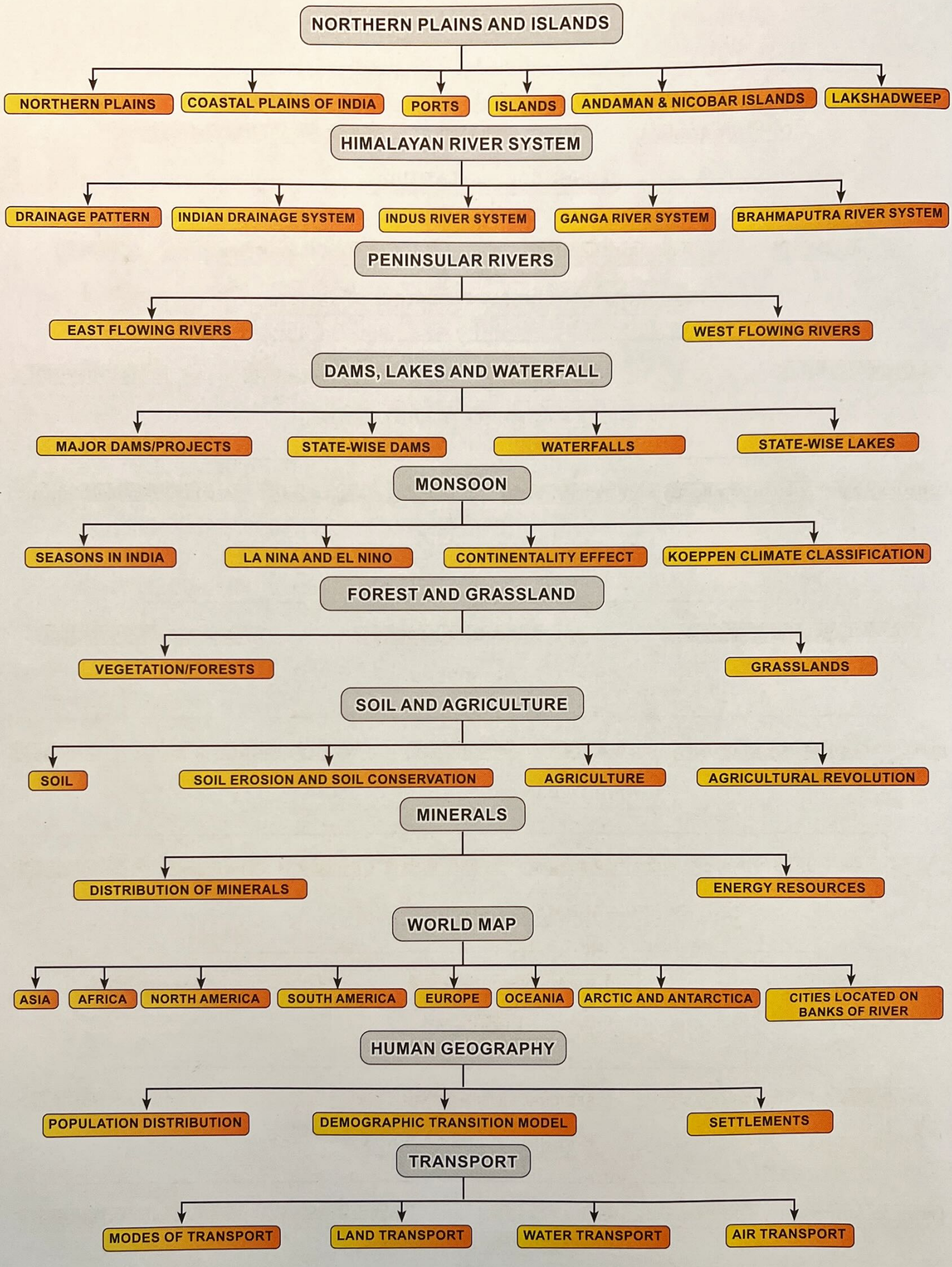
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• Study of Universe is known as: ***Cosmology***.

Universe consists of many Galaxies, a galaxy in turn consists of many solar systems.

• Branch of science that deals with celestial bodies: ***Astronomy.***

ORIGIN OF UNIVERSE

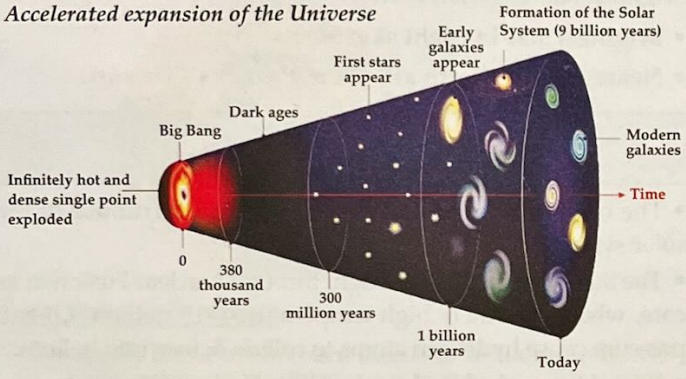
• Various theories have been given on how the universe came into existence.

Big Bang Theory

• Big Bang was an explosion of concentrated matter in the universe that occurred ***13.8 billion years ago***, leading to the formation of galaxies of stars and other heavenly bodies.

• Origin of Big Bang Theory (also known as Big Bang Explosion) was given by ***Georges Lemaitre*** in ***1927*** and published in ***1931***.

Accelerated expansion of the Universe



Edwin Hubble Theory - (1929)

• Edwin Hubble proposed the expanding universe hypothesis, demonstrating that distant galaxies are moving away from Earth with velocities proportional to their distances (now known as Hubble's Law), which provided the first strong observational evidence that the universe is continuously expanding.

Steady State Theory - (1948)

• It was given by ***Fred Hoyle***, Hermann Bondi, and Thomas Gold.

• This theory proposes that the ***universe is constantly expanding, but its average properties remain unchanged.***

Galaxy

• A galaxy is a massive collection of stars, gas, dust, and dark matter held together by gravity.

• Our galaxy is ***Milky Way Galaxy (or the Akash Ganga/ Mandakini)*** formed after the Big Bang.

• ***Andromeda/M-31*** is the nearest galaxy to the Milky Way.

Our solar system lies in the Orion Spur, a small spiral arm of the Milky Way located between the Sagittarius and Perseus arms.

ORIGIN OF SOLAR SYSTEM

• The formation of Solar System began ***4.6 Billion years ago,*** while the age of Earth is ***4.5 Billion years*** old.

Theories related to the origin of solar system

1. Copernicus Theory:

• De revolutionibus orbium coelestium is the Heliocentric theory of ***Nicolaus Copernicus, given in 1543***.

• It predicted that the ***Sun is at the centre*** of the universe, with the Earth and other planets orbiting around it.

2. Nebular Hypothesis:

• First proposed by ***Immanuel Kant in 1755*** and independently expanded upon by ***Pierre-Simon Laplace in 1796***.

• The process started when a cloud of gas and dust collapsed, forming a spinning disk called the solar ***Nebula***.

• Gravity pulled material to the center, forming the Sun, while the rest flattened into a spinning disk. Dust and gas clumped into planetesimals, which merged to form planets. The Sun formed in the center, and the planets formed in a thin disk orbiting around it → ***It is the most widely accepted hypothesis***.

3. Planetesimal Theory:

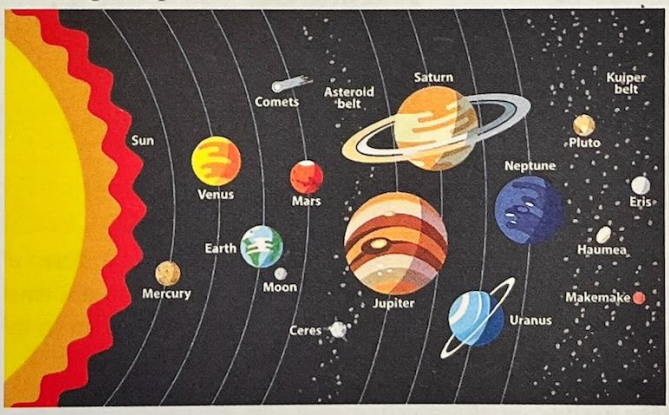
• ***Thomas Chrowder Chamberlin and Forest Ray Moulton concluded (in 1905) that*** a passing star came close to the Sun and, due to its gravitational attraction, a portion of the Sun's matter was drawn out.

• This matter gradually cooled and combined to form the planets.

4. Binary Star Hypothesis:

• It was proposed by ***H.N. Russell in 1937***.

• The Binary Star Hypothesis proposes that Earth and the other planets formed from debris left behind when the Sun's companion star exploded, with the material eventually coalescing into planets.



• Our Solar System has ***8 planets and 5 Dwarf planets***.

CELESTIAL BODIES

• Celestial bodies are objects in space that glow in the night sky, such as planets, stars, moons, asteroids, comets, and galaxies.

They are classified into

Luminous	Non-luminous
Those celestial bodies that emit their own light.	Those celestial bodies that do not emit their own light.
Eg. Stars, Firefly	**Eg. Moon, Comets, Asteroids, Meteorites, Meteor, Meteoroid.**

Comets

• Comets are *large, icy objects* that orbit the Sun. They are made of dust, rock, and frozen gases like water, carbon dioxide, ammonia, and methane and when it passes near the Sun, its ice starts melting, creating two tails: ion tail & dust tail.

• Comets generally come from the Kuiper belt (short-period comet) or the Oort cloud (long-period comet).

Oort Cloud: *Cloud-like form of icy objects and dust particles, beyond the Kuiper belt.*

• ***Halley's Comet:*** It is *seen every 76 years*. It was last seen in 1986 and is expected to return in 2061.

Asteroid

• An asteroid is a *rocky, metallic, or icy object* that orbits the Sun.

Meteoroid

• A meteoroid is a *small, rocky or metallic space rock* that orbits the sun. These are *much smaller than asteroids*, ranging in size from dust grains to objects up to a meter wide.

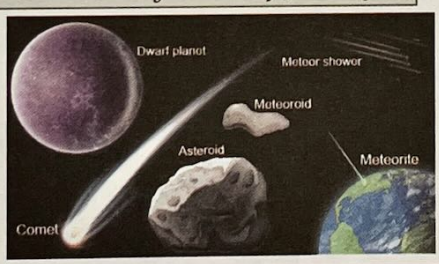
Meteor

• When a meteoroid enters Earth's atmosphere (in Mesosphere), *it burns up and creates a streak of light* called a meteor (also known as *Shooting Star*).

• *Meteor shower name Quadrantids is visible in the early month of January.*

Meteorite

• If the meteoroid survives its trip through the atmosphere, it hits the ground and is called a meteorite.

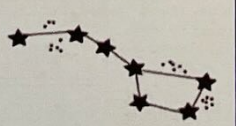


CONSTELLATION

• A constellation is a group of stars that appear to form a pattern or shape in the night sky. Every constellation forms an asterism which is a group of stars that form a pattern in the night sky.

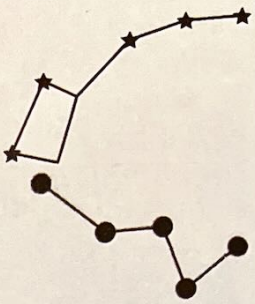
Ursa Major Constellation

• It is also known as the *Great Bear and Saptarishi (in India)*, is a constellation in the northern sky. Big Dipper asterism is seen in Ursa Major (*Brightest star - Alioth*).



Ursa Minor

• Ursa Minor, also known as the Little Bear, is a prominent constellation in the northern sky (*Brightest star - Polaris*).

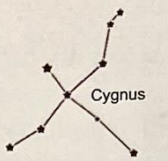


Cassiopeia

• It is a W-shaped constellation. *The brightest star of Cassiopeia is Schedar* (also known as *Alpha Cassiopeia*).

Cygnus

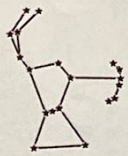
• It is a prominent northern constellation known for its distinctive *cross shape.*



Sagittarius: Bow and cross shaped constellation.

Orion

• Orion (also known as *The Hunter*) is a prominent set of stars visible during winter in the northern celestial hemisphere. The brightest star of Orion is *Rigel*.



• **Brightest star in night sky:** *Sirius*.

• **Nearest star to Earth after sun:** *Proxima Centauri*.

THE SUN

• The only star in our solar system and **powerhouse** of the solar system.

• The Sun produces its own light through Nuclear Fusion in its core, where extremely high temperature (~15 million °C) and pressure cause hydrogen atoms to collide & fuse into helium.

• It is composed of *Hydrogen (73%), Helium (25-28%) and other gases.*

• It carries almost *99%* of the mass of our solar system.

The science of studying the Sun and its influence throughout the solar system is called **Heliophysics.**

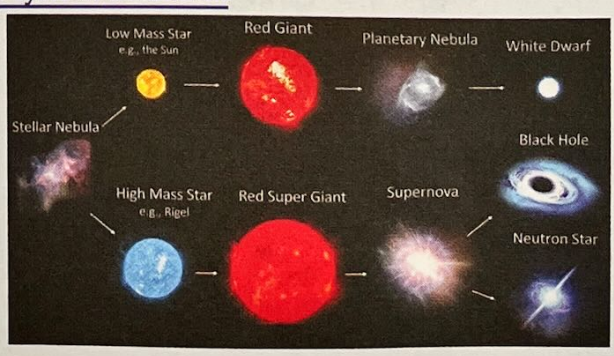
• Approximately *15 crore Kilometre (149.6 Million Km)* further away from Earth. It takes around *8 minutes 20 seconds* for light at the speed of *3 lakh Km/sec* to reach the earth.

• ***Temperature at surface = 5800K or 5600°C***

• ***Temperature at the center = 15.7 million K***

Note:
*K: Kelvin

Life cycle of a star/Sun



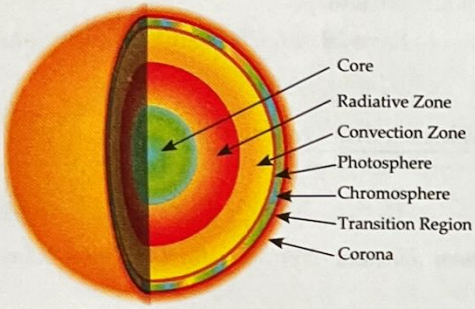
• The life cycle of a star, including our Sun, is determined primarily by its mass: low-mass stars live for tens of billions of years, medium-mass stars (like the Sun) for about 10–12

Click here

billion years. Eventually **small stars become white dwarfs,** whereas **massive stars end up** as a neutron star or a **black hole** following a fierce supernova explosion.

- **Stellar Nebula:** Birthplace of stars, clouds of gas and dust.
- **Average Star:** Current stage of the Sun (~4.6 billion years old, halfway through its ~10 billion-year life).
- **Red Giant:** When hydrogen runs out, the Sun will expand enormously and shed its outer layers.
- **Planetary Nebula:** Outer layers drift away, leaving the hot core.
- **White Dwarf:** Dense, faint remnant of the Sun's core.
- **Black Dwarf:** Eventually cools and fades into a cold, dark remnant.

Layers of Sun: Core < Radiative Zone < Convective Zone < Photosphere (Outermost visible part) < Chromosphere < Corona (Outermost layer but not visible with naked eye, extremely hot and only visible during solar eclipses).



Solar flares & Sunspots

Solar flares: These are sudden bursts of radiation caused by magnetic activity on the Sun (short-lived powerful bursts of energy).

Solar wind: It is the continuous flow of charged particles from the Sun's corona (steady, ongoing flow of particles).

Sunspots: These are temporary, planet-sized, darker regions on the Sun's surface caused by intense magnetic activity that inhibits heat transfer, making them cooler than the surrounding photosphere.

Magnetic Cycle: The Sun's magnetic activity peaks every 11 years, increasing the number of sunspots and solar flares.

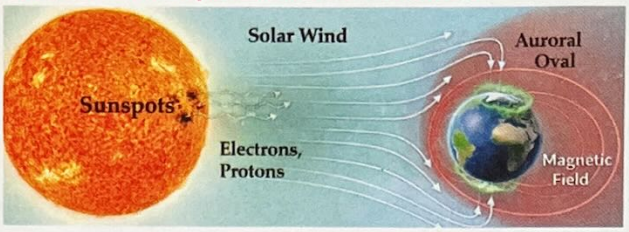
Solar flares effect on Earth: Damage spacecraft electronics, GPS signal disturbance, Geomagnetically induced current in power systems which may cause black-outs, Radiation effects on avionics and communication, induced effects in submarine cables etc.

When solar flares and solar winds interact with Earth's magnetic field, they trap charged particles, forming the Van Allen Radiation Belt around Earth.

Difference between Solar flares and Coronal Mass Ejections (CMEs):

Both phenomena are caused by magnetic reconnection on the Sun, but CMEs involve the expulsion of physical material, whereas solar flares are primarily bursts of light and high-energy particles. While they often occur together, they can also happen independently.

Aurora: As the magnetic field of Earth is lesser in the polar regions, Sun's solar flares hit the atmosphere on poles, creating such light phenomenon in both *north pole (Aurora Borealis) and south pole (Aurora Australis).*



PLANETS

Classification of Planets

Terrestrial Planets	*Jovian Planets*
They are relatively very small	They are immense in size
They are made of rocky material	They are made of gaseous material
Their surface is solid	They do not have a solid surface
They are nearer to Sun	They are far away from Sun
They have few /no moons	They have multiple moons
They do not have rings	They support ring systems
Eg. Mercury, Venus, Earth, Mars	**Eg. Jupiter, Saturn, Uranus, Neptune**

Jupiter and Saturn (gas giants), Uranus and Neptune (ice giants)

Mercury

- It is the *closest planet* to the Sun.
- It is the smallest planet in the solar system with a diameter of *4900Km.*
- It is the fastest planet with speed of *172500 km/h* or *47 km /sec* to complete revolution around Sun in *88 days.*
- It is the only planet that has *no atmosphere.*
- It is a planet with second highest density

Venus

- It is the *hottest planet* in the solar system.
- It is also known as *"Earth's Twin"*. It is because of the similarity in size and mass between Venus and Earth.
- *Brightest planet in the Solar system.* It can be seen in the morning and evening with open eyes.
- This planet has the *slowest rotation.* It takes *243 Earth days* to complete one rotation.
- Venus is covered with thick clouds of *Sulfuric acid* (H_2SO_4).
- *Other names for Venus*: **Morning star, Evening star, Lucifer (light bringer).**

• All planets have satellites except Mercury and Venus
• All planets rotate from West to East except Venus and Uranus (they rotate from East to West)

Earth

- The only Planet to give support to life with a pleasant atmosphere.
- It is also known as *"Blue Planet"* because of the presence of water *(70%)* on it.

- It has *one natural satellite named "Moon"*.
- It is a planet with *highest density (5.51 g/cm^3)*
- Closest planet to Earth is Venus.

Mars

- It is known as *"Red Planet" because of iron-rich red soil.*
- It is the *second smallest planet* in the solar system after Mercury.
- It has two natural moons *"Phobos"* and *"Deimos"*.
- It has a thin atmosphere and surface covered with valleys, craters, deserts, and ice caps etc.
- *"Olympus Mons" (height: 22–25 km)* is the largest volcano and the tallest mountain in the solar system and lies on Mars.
- Length of a day in Mars equal to *24 hr and 37 minutes.*
- *The asteroid belt is found between the orbits of Mars and Jupiter.*
- *Asteroid Bennu studied by NASA's OSIRIS-REx mission.*

Jupiter

- It is the largest planet of the solar system with *the shortest rotation of 9 hours 55 minutes.*
- It has an atmosphere filled with Hydrogen, Helium and other gases.
- Jupiter is the *third brightest object in the night sky* after the Moon and Venus, but generally three brightest objects in the sky are Sun, Moon and Venus.
- Great Red Spot, a giant storm in the solar system, exists on this planet.
- At present it has *97 moons*, including four large Moons *"Io, Europa, Ganymede, and Callisto (has evidence of Ozone layer)"*, also known as *Galilean Moons* because they were discovered by *Galileo. "Ganymede"* is the largest among them.
- It has a faint ring system.

Saturn

- It is the *second largest planet* in the solar system.
- It has bright and concentric rings around it which are made up of tiny rocks and pieces of ice.
- Saturn is the planet with *the least density (0.69 g/cm^3)*. Apparently, it can float in water.
- At present it has *274 moons and Titan is the largest* among them.
- Satellites of Saturn → *Titan (largest moon) and Enceladus show possibility of life on it.*
- *In 1655:* **Huygens discovered Saturn's rings.**
- *In 1675:* **Cassini discovered the gap between rings.**
- **Rotation time-** *10.7 hours.*
- **Revolution time-** *29.4 Earth years.*

Uranus

- It is greenish in colour, hence known as the *"Green Planet" due to the presence of Methane gas in its atmosphere (CH_4).*
- It was discovered by *William Herschel in 1781.*
- The atmosphere of Uranus is composed of Hydrogen and Helium primarily, but it also contains more water, ammonia etc.
- It has *coldest planetary atmosphere* in the solar system.
- It has *at least 27 moons.* Famous moons → *Miranda, Ariel, and Umbriel.*
- It is tilted to 98° at the axis, hence called the *"Rolling/ Lopsided Planet".*
- **Rotation time-** *17 hours.*
- **Revolution time-** *84 Earth years.*

Neptune

- It is the farthest planet from the Sun with the *longest/ slowest revolution of 165 years.*
- Its rotation time is *16 hours.*
- Atmosphere primarily composed of Hydrogen and Helium. It is the windiest planet.
- *It is bluish in colour because of Methane.*
- It was discovered by *Johann Galle and Urbain Le Verrier in 1846.* The only planet in the solar system found by Mathematical Predictions.
- It is known to have *14 satellites* and the most famous moon is *Triton.*

Planets in Decreasing Order of their size

J S U N E V M M

Jupiter Saturn Uranus Neptune Earth Venus Mars Mercury

Moon

- The Moon is Earth's *only natural satellite.*
- It is *non-luminous in nature.*
- *Radii = 1.74 x 10^{6}m*
- Moon's light takes *1.26 seconds* to reach Earth's surface.
- *Distance between Earth and Moon = 3,84,00km*
- *Gravity on Moon = Earth's Gravity/6*

• Thin orbit envelope around the moon is known as Lunar Exosphere.

- Only one side *(near side)* of the Moon is visible (roughly of it is visible) and the remaining side *(far side)* is not visible to the naked eye.

Reason

Rotation time = Revolution time → 27.3 Days

- Highest point on moon: *Mt. Leibniz (Now officially known as Mons Huygens).*

SOLAR, LUNAR AND MARS MISSIONS

Sun

- *Aditya-L1 Mission:* This is India's first solar observatory mission launched by the *Indian Space Research Organisation (ISRO)* to study the Sun.

L_1 refers to the first *Lagrange Point* on the Sun There are a total of *5 Lagrange Points (L_1 to L_5).*

Headquarter of IAU: Paris, France

Moon

Chandrayaan-3:

- It is the third lunar-exploration mission of Indian Space Research Organisation (ISRO).
- *Lander:* Vikram (landed on 23rd August, we celebrate it as National Space Day).
- *Rover:* Pragyaan.
- *Point*: Shiv Shakti Point.
- Chandrayaan-3 landed on the *near side of the moon (Lunar South Pole).*

The Lagrange Points are positions where the gravitational pull of two large masses precisely equals the centripetal force required for a small object to move with them.

- *Launch Vehicle:* GSLV-Mk3

Upcoming missions-

Chandrayaan-4: (mission by ISRO) will carry the lunar samples (regoliths) from Moon back to Earth.

Chandrayaan-5: LUPEX (Lunar Polar Exploration) Mission by ISRO (lander) and JAXA (rover and vehicle), explore the southern pole on moon for a longer time.

Artemis II:

Agency: NASA

- *Artemis I- tested systems,*
- *Artemis III- will land humans on the Moon.*

Launch Date: *April 1, 2026,* from Kennedy Space Center.

Crew: Reid Wiseman, Victor Glover, Christina Koch, Jeremy Hansen.

- First crewed mission; astronauts orbited the Moon for 10 days, studied lunar features, and tested life-support systems.

Mars

Mars Orbiter Mission (MOM): (Mangalyaan) is a space probe sent by ISRO, orbiting Mars since 24 September 2014. With this ISRO became the first agency in the world to land on Mars successfully on its first attempt, without any country's help.

Upcoming mission-

MOM-2 is expected to carry a rover and even a pioneering helicopter, making it India's most ambitious Mars project yet.

DWARF PLANETS

Kuiper Belt

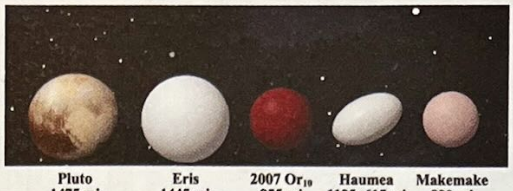
- It is a *ring of bodies beyond Neptune* containing a number of asteroids, rocks, and comets.

Pluto

Pluto was discovered by Clyde Tombaugh.

- As per the new definition of Planets determined by International Astronomical Union (IAU), *Pluto has been omitted from the list of planets in 2006* as it was not be able to clear its orbit of debris.
- Pluto is considered as a dwarf planet (size between planets and asteroids) now and it is now a member of *Kuiper Belt*.
- Pluto's largest moon: *Charon (out of 5 moons of Pluto).*
- *1 revolution of Pluto = 248 Earth years.*
- Pluto's oblong orbit overlaps with that of Neptune.

Largest Dwarf Planet



Pluto 1475 mi (2374 km) | Eris 1445 mi (2326 km) | 2007 Or_{10} 955 mi (1535 km) | Haumea 1195×615 mi (1920×990 km) | Makemake 890 mi (1430 km)

- *Pluto:* Largest and brightest dwarf planet.
- *Eris:* Second largest dwarf planet.
- *Makemake:* Third largest and it orbits in 310 years.

} *Located in kuiper Belt*

- *Haumea:* Fastest rotating dwarf planet in Kuiper Belt.
- *Ceres:* This dwarf planet is present in Asteroid Belt.

Three Characteristics of Planets

1. To be around the Sun.
2. To have a nearly spherical shape.
3. They should be able to clear their orbit of debris

The International Space Station (ISS)

- It is the largest man-made object in Space and a collaborative project of 5 space agencies: NASA, Roscosmos, JAXA, ESA, and CSA.
- The first module of the ISS Zarya control module was launched in 1998 & the station was fully assembled in 2011.
- The ISS is in orbit about 400 kilometre above Earth(at an inclination of 51.6°) and travels around Earth at a speed of about 28000 Km/h. This means that it orbits Earth about every *90 minutes.*

India aims to build Bhartiya Antariksh Station by 2035 in a 400 km Orbit above the Earth.
Tiangong is China's self-built space station.

The Chandrasekhar limit

- Proposed by *Subrahmanyan Chandrasekhar* in *1930,* earning him the *1983 Nobel Prize in Physics.*
- It is the maximum mass a white dwarf star can have before collapsing under its own gravity—about 1.44 times the mass of the Sun. Beyond this limit, electron degeneracy pressure can no longer resist gravitational collapse, leading to a supernova and the formation of either a neutron star or a black hole.

Terms to Understands

- *Supernova:* Explosion of star.
- *Pulsar:* A neutron star.
- *Black Hole:* A place in space with immense gravity.
- *Van Allen Radiation Belts:* These are two concentric rings of charged particles that surround the Earth.

THE EARTH

• **Geodesy** is the science of accurately measuring and understanding the Earth's geometric shape, orientation in space, and gravity field.

Shape of Earth

• Shape of Earth is *Geoid or Oblate Spheroid* (a little flat from top and bottom) and bulged at the centre.

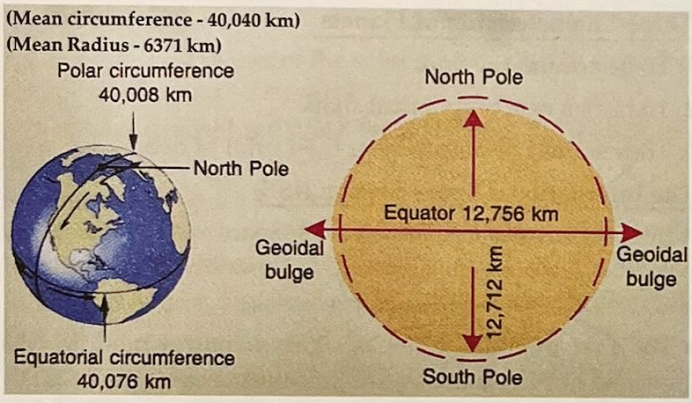
└ *Reason:* Centrifugal force (due to rotation of Earth)

• ***Equatorial radii (6378 km) > Polar radii (6357 km).***

Difference between ER and PR is about 21-22 km.

• ***Equatorial circumference > Polar circumference.***

(All because the Earth is bulged at the equator and fattened at the poles).



Rotation of Earth

• Earth rotates on its own axis, from West to East (Anti-clockwise).

• One rotation of Earth = 23 hour 56 minutes 4 seconds.

• Rotational speed is maximum at the equator (Equatorial Speed) and minimum at the poles (Polar Speed).

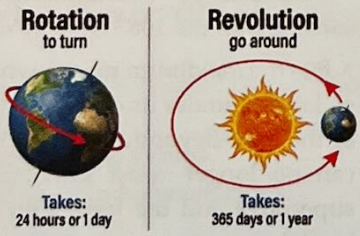
• ***Day and night are caused by the Earth's rotation on its axis.***

Revolution of Earth

• Earth revolves around the Sun in an elliptical orbit.

• One revolution = ***365 days 5 hours 59 minutes*** and ***16 seconds***.

• Orbital speed = 29.8 km/s.



Rotation vs Resolution

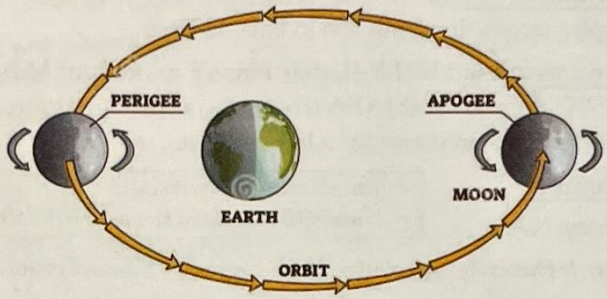
• Mercury has the maximum orbital speed 47.87 km/s at perihelion.

• Neptune has the minimum orbital speed 5.43 km/s.

• ***The Earth's revolution around the sun and the tilt of its axis (23.5°) together cause the seasons.***

Distance of Earth from Sun and Moon

Sun	*Moon*
• The point in a planet's orbit when it is closest to the Sun is called ***Perihelion. On January 3rd, the Earth is nearest to the Sun*** (147 million km). • The point in a planet's orbit when it is ***farthest from the Sun*** is called ***Aphelion. On July 4th***, the ***Earth is farthest from Sun*** (152 million km).	The point in the moon's orbit when it is ***closest to Earth*** is called ***Perigee.*** At perigee, ***the moon appears larger in the sky.*** • The point in the moon's orbit when it's farthest from Earth is called ***Apogee.*** At apogee, the moon's ***tidal-raising force is smaller, and the tidal ranges are less than average.***

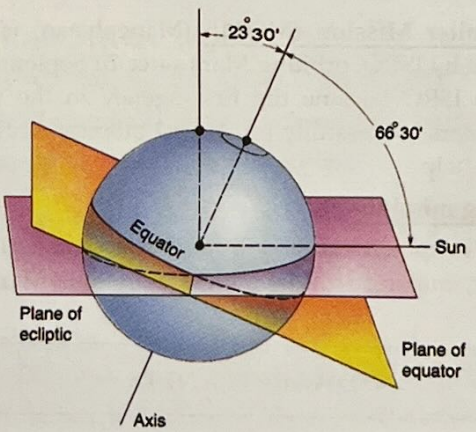


Perigee and Apogee

Inclination of Earth's Axis

• ***Axial inclination:*** Inclination of Earth on its axis = **23.5°**.

• ***Orbital inclination:*** Inclination of Earth on its orbital plane = **66.5°**.



LATITUDE AND LONGITUDE

Latitude

• They are imaginary horizontal lines on the globe that run from ***East to West.***

• It is the angular distance of a place from the equator.

• The number of total latitudes is 181 but latitude circles are 179 in number (as 90°N & 90°S are only points, not circles)

• Distance between each latitude is same.

• **1° of latitude = 111 km.**

Important Latitudes

• 0°: Equator (divides Earth into two equal parts) → Northern and Southern Hemisphere.

• $23\frac{1^\circ}{2}$ N: Tropic of Cancer.

• $66\frac{1^\circ}{2}$ N: Arctic Circle.

• $23\frac{1^\circ}{2}$ S: Tropic of Capricorn.

• $66\frac{1^\circ}{2}$ S: Antarctic Circle.

• All parallel circles from the equator to the poles are known as "Parallels of Latitude".

• Largest latitude: ***Equator.***
• Smallest latitude: ***Poles (North and South).***

Longitude

• They are ***imaginary vertical lines*** (also called Meridians) over the globe that run North to South.

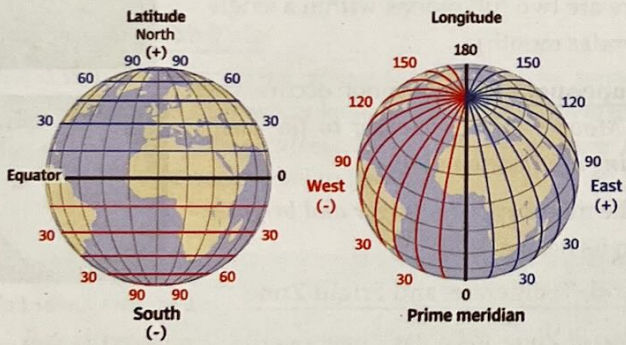
• It is an angular distance of a place from Prime Meridian.

• Distance between each longitude deceases from Equator towards poles, at the poles it is ***0,*** while it is maximum at the equator ***(111.32 Km),*** but length of each longitude is same.

• **Total longitudes 360°.**

Gore: A sector of curved surface of earth that lies between two longitudes, in simple words, Gore is the distance between two consecutive longitudes.

Note - We need both latitude and longitude for the location of a place.



Important Meridians *(Longitude)*

• Prime Meridian-0" longitude (passes through Greenwich, London).

• 180°E & 180°W are the same longitude (unlike latitudes), that's the opposite of 0° or prime meridian. This 180° meridian is the International Date Line.

• Prime Meridian also known as ***International Meridian or Greenwich Meridian.*** It passes though

Burkina Faso	**→ B**
Spain	**→ S**
Ghana	**→ G**
Algeria	**→ A**
Mali	**→ Me**
Togo	**→ In TOGO**
UK	**→ KINGDOM**

TRICK TO REMEMBER
BSF GAMe in TOGO KINGDOM

Prime Meridian

Concept of Time using Longitude

• 360° – 24 hours

• 15° = 1 hour

• $1^\circ = \frac{60^\circ}{15} = 4$ minutes (Time taken in each 1°)

International Date Line

Question - If it is 12 noon at 60°E longitude, then explain what would be the time at 30° E Longitude?
Answer. Difference in longitude: $60°E - 30°E = 30°$
Time difference: 30°× 4 minutes = 120 minutes = 2 hours
Since 30°E is west of 60°E, it will be earlier in time.

• Moving ***East away from Prime Meridian,*** the time will ***increase*** by an ***hour*** for ***every 15°,*** consecutively if we ***move to West*** from the ***Prime Meridian,*** the time will ***decrease*** by an ***hour*** for ***every 15°.***

• Entire earth is divided into ***24 Times Zones. France*** has the ***most number*** of Time Zones ***(13) Russia*** (11 time zones), ***US*** (6 time zones).

International Date Line *(180 E/W)*

• It is the ***imaginary zig-zag line*** passing through the Pacific Ocean from where the date changes.

• While crossing International Date Line eastbound i.e. from ***East to West*** (**Eg.** ***Japan to USA***) → Date is subtracted by 1 or in other words, ***the person gains a day*** and vice versa.

Concept of Great Circle

• Isochrones: They are lines joining points located at equal travel time from a common centre.

• A great circle is the largest possible circle that can be drawn around a sphere.

• It divides the Earth into ***two equal parts called Hemispheres*** (Northern and Southern).

• ***All longitudes are considered great circles,*** but only one latitude is considered a great circle and that is ***Equator*** (0° latitude).

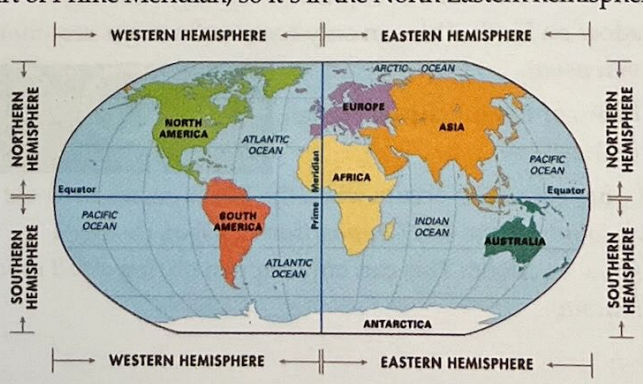
Hemisphere

• Equal division of Earth in two parts.

• ***Equator:*** It divides the globe horizontally into two equal parts: ***Northern and Southern hemisphere.***

• ***Prime Meridian:*** It divides the globe vertically in two equal parts: ***Eastern and Western Hemisphere.***

• India is located in the Northern part of Equator and Eastern part of Prime Meridian, so it's in the North Eastern hemisphere.



SOLSTICE AND EQUINOX

• **Solstice:** A solstice is an astronomical event that occurs twice a year when the sun reaches its highest or lowest point in the sky, resulting in the longest day or shortest day of the year.

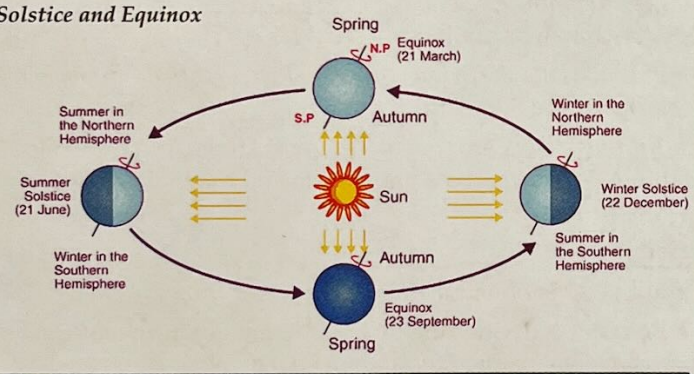
Summer Solstice	*Winter Solstice*
It occurs on *21st June*	It occurs on *22nd December*
It is the longest day of the year in Northern Hemisphere	It is the shortest day and longest night of the year in Northern Hemisphere
The vertical rays of Sun are directly overhead on *Tropic of Cancer*	The vertical rays of Sun are directly overhead on *Tropic of Capricorn*
Northern Hemisphere gets more heat	Southern Hemisphere gets more heat
Continuous sun rays fall on the North Pole for 6 months	Continuous sun rays fall on the South Pole for 6 months

• **Equinox:** An equinox is a time when the *Sun's apparent path in the sky crosses the equator, making day and night approximately equal in length.* At this position, neither of the poles is tilted towards the Sun.

• *Vernal or Spring equinox: 21st March.*

• *Autumnal or Fall equinox: 23rd September.*

Solstice and Equinox

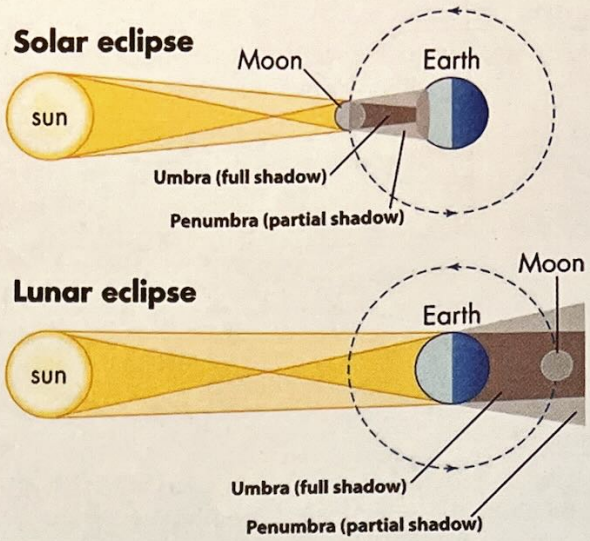


• Syzygy: When the Sun, Moon and Earth, all are aligned in a straight line, the alignment is known as Syzygy.

• **Solar eclipse:** It occurs when the *Moon passes between the Earth and the Sun (Conjunction Syzygy),* casting a shadow on Earth. This can only happen during a *new moon (Amavasya).*

• **Types of Solar Eclipse:** Partial, Annular, Total

• **Lunar eclipse:** It occurs when the *Earth passes between the Moon and the Sun (Opposition Syzygy),* casting a shadow on Moon. This can only happen during a *full moon (Purnima).*



• **Umbra & Penumbra:** During a solar or lunar eclipse, the darkest, innermost central part of shadow is called Umbra, and lighter, diffused outer part of the shadow that surrounds the umbra, is known as Penumbra.

• **Red moon:** When Earth blocks the Sun's light (light refraction), it causes *blue colour (scatters more)* light to vanish and *red light to reach moon (scatters less).*

• **Blue moon:** Blue moon (occurs when there are two full moons within a single calendar month).

• **Supermoon:** A supermoon occurs when the *Moon's orbit is closest to the Earth during a full/new moon.*

• The moon appears *larger and brighter* than its normal size.

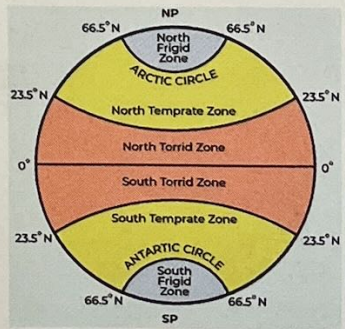
Perigree + Lunar Eclipse

Torrid, Temperate, and Frigid Zone

• *Torrid Zone:* Receives direct overhead rays of the Sun due to which it is the *hottest zone.* It is located between the Tropics.

• *Temperate Zone:* Region between Tropic of Cancer & Arctic Circle or Tropic of Capricorn & Antarctic Circle. It receives slanting rays of the Sun.

• *Frigid Zone: Coldest region* on Earth which experiences daylight for 6 months and 6 months of night (due to the tilt of Earth). Located beyond the Arctic $\left(66\frac{1^\circ}{2}\text{N}\right)$ & Antarctic Circle $\left(66\frac{1^\circ}{2}\text{S}\right)$.



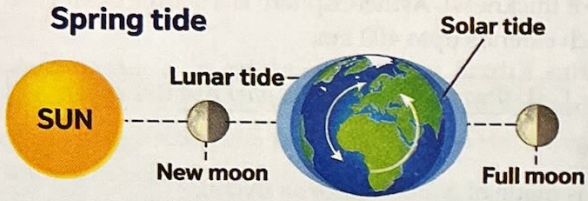
Frigid, Temperate and Torrid Zone

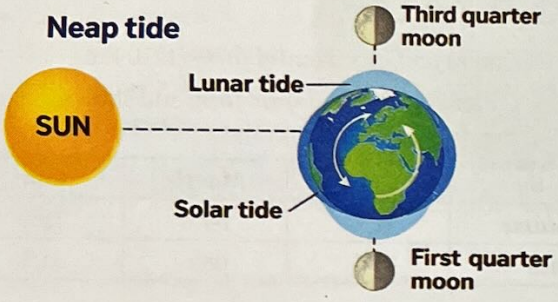
TIDES

• **Tides:** Tides are the periodic rise and fall of the ocean's water levels. They are caused by the gravitational pull of the moon and the sun on the Earth's oceans. They are of two types:

• **Neap Tides:** They occur when Earth, Moon, and Sun are in *perpendicular alignment (Quadrature)*.

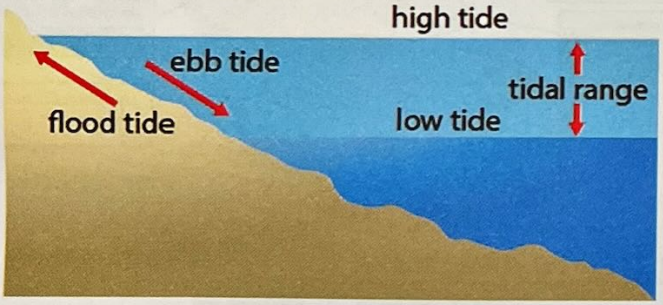
• **Spring Tides:** They occur when the Earth, Moon, and Sun are in *straight line alignment (Syzygy)*.

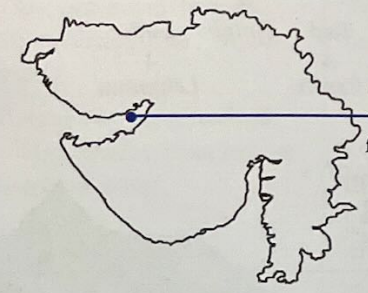




Flood Tide and Ebb Tide

• Flood tide is the *incoming, rising tide that moves toward the coast,* increasing the water level to high tide. Conversely, ebb tide is the outgoing, *falling tide that recedes from the land,* lowering the water level to low tide.





Gulf of Kutch in Gujarat has maximum potential for tidal energy due to its shape

• **Diurnal tides:** Tidal cycles with *one high tide and one low tide each lunar day,* commonly found in the Gulf of Mexico and parts of Alaska.

• **Semi-Diurnal tides:** Tidal cycles with *two nearly equal high tides and low tides every lunar day*.

• The difference of time between two successive High tide and low tide is approximately *6 hours and 12 minutes*.

• The difference of time between two successive high tides is approximately *12 hours and 26 minutes*.

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EARTH'S INTERIOR

• **Geology:** The scientific study of the Earth, including its composition, structure, rocks, soil, and the processes that shape.

Father of Geology: James Hutton

Sources to know about Earth's interior

Direct Sources	*Indirect Sources*
Volcanoes	Temperature
Rocks	Meteorites
	Earthquake

• The Kola Superdeep Borehole, located on Russia's Kola Peninsula, is the deepest drilling done on Earth by humans till now, for scientific research, reaching a maximum vertical depth of 12 km.

• Even the mines in South Africa have a maximum depth of 3-4 km.

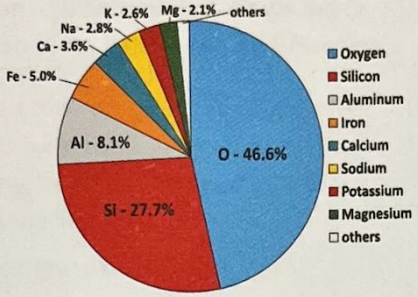
Layers of Earth

Crust

• Generally, the crust is made of *Silica* and *Aluminium (SiAl).*

• ***Thickness:*** *5-70 km.*

• The overall crust is brittle in nature.

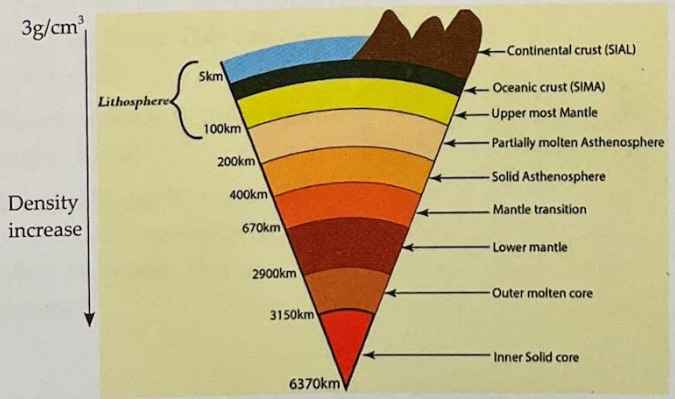


Composition of Earth's crust

Most Abundant Element: *Oxygen*
Most Abundant Metal: *Aluminium*

• ***Crust has two divisions:***

Continental Crust	*Oceanic Crust*
It is the land of the crust, the outermost layer of the Earth that makes up the continents and continental shelves	It is the water part of the crust, the solid layer Earth's crust that lies beneath the ocean.
It is thick (30 km)	It is thin (5km)
It is lighter	It is denser
It is made of granitic rock	It is made of Basaltic rock.
Mean density - 2.7 g/cm^3	Mean density - 2.9 g/cm^3



Mantle

• It is made of *Silica* and *Magnesium (SiMa).*

• ***Thickness:*** *2900 km.*

• ***Mean density:*** 4.5 g/cm^3

• ***Mantle has two divisions:*** *Upper Mantle and Lower Mantle.*

• ***Asthenosphere:*** It is a *semi-solid/semi-molten layer* of earth's upper mantle that is mechanically weak and ductile. It lies *beneath the lithosphere* (the rigid outermost layer of earth made up of crust and upper solid mantle with 10-200 km of thickness). Asthenosphere is a source of *magma/lava,* which extends upto 400 km.

Asthenosphere is not a part of Lithosphere.

Core

• It is made of *Nickel* and *Iron (NiFe).*

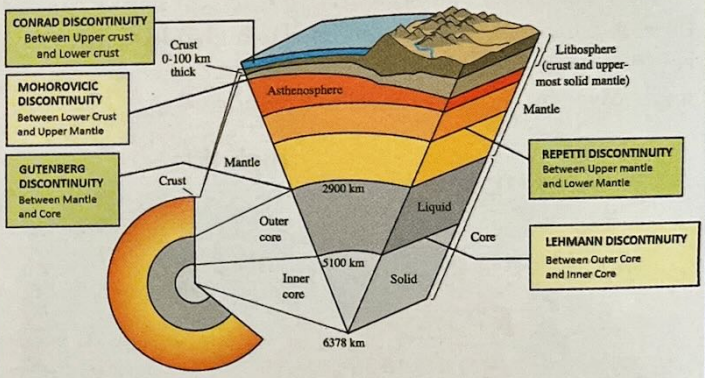
• ***Mean density:*** 13 g/cm^3.

• ***Core has two divisions:***

1. ***Inner core:*** It is in *solid form* (1220 km).
2. ***Outer core:*** It is in *liquid form* and shows magnetic properties (2200 km).

By	*Crust*	*Mantle*	*Core*
Volume	1%	84%	15%
Mass	1%	68%	31%

Earth's Discontinuity.



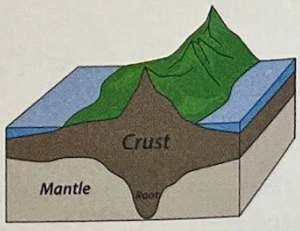
TRICK TO REMEMBER

Mohorovicic ↑ *Koi* ↓ *Conrad*
Mujhe
Gutenberg ↑ *Gulab* ↓ *Lehmann*
Red ↓ *Repitti*

Mountain isostasy

• Mountains rest on the Earth's crust like icebergs floating in water, with deep "roots" extending into the mantle.

The higher the mountain, the deeper its root below the Earth's surface to maintain balance.



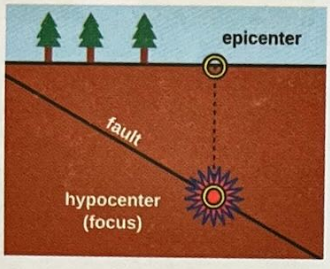
Theory of Plate Tectonics: It is given *Mckenzie* and *Parker* in *1967*. This theory suggests that the *Earth's lithosphere* (crust and uppermost mantle) is broken into large, rigid plates that move and interact with each other, driving various geological phenomena such as earthquake.

• Convection current that occurs in the asthenosphere is the force behind the plate movement. The heat from the Earth's interior causes currents of hot rising magma and cooler sinking magma to flow, moving the lithospheric plates along with them.

Earthquake

• An earthquake is an intense shaking of Earth's surface, which is caused by *shifting of Earth's plate*. It is a sudden release of energy along the fault line in the form of waves (also known as *seismic waves*).

• ***Epicentre:*** It is the point on the Earth's surface directly above the *earthquake's focus* (also known as the hypocentre), where the earthquake originates underground.



• ***Hypocentre:*** It is the point within the Earth where the *earthquake begins*.

• All natural earthquake occur in *lithosphere*.

• Earthquake generate seismic waves, which are vibrations that travel through the earth in the form of *body waves* and *surface waves*.

Body Waves

These waves travel through the Earth's interior with high speed.

They are of two types: *P-waves and S-waves.*

P-waves	*S-waves*
They are also known as primary waves	They are also known as secondary waves
They are the fastest seismic waves (first to record on seismograph) → 7-8 km/sec	They are the slow seismic waves in comparison to P-waves → 4-6 km/sec
They can travel through all medium (solid > liquid > gas)	They can travel through only solids
P-waves are longitudinal compression waves, similar to sound waves	S-waves are transverse waves, that causes the ground to vibrate perpendicular to the direction of the wave
They cause stretching and squeezing because they vibrate parallel to the direction of waves	They create crests and troughs because they vibrate perpendicular to the direction of waves

Note: *Shallow focus, earthquakes have more intensity than the deeper ones.*

Surface Waves

• When body waves come in contact with *surface rocks*, they form surface waves.

• They are more destructive in nature and cause displacement of rocks.

Surface waves are of two types

Love waves	*Rayleigh waves*
They move the ground side-to-side horizontally.	They produce a complex, rolling motion in the ground (similar to ocean waves).

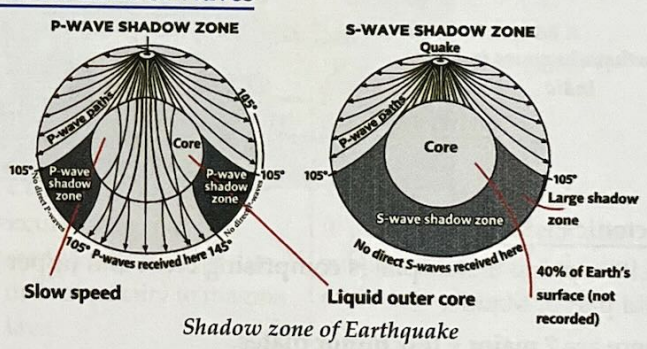
• They are the *last to be recorded* on seismograph.

A seismograph is an instrument that measures and registers seismic waves that travel through the Earth as the outcome of an earthquake.

Scales to Measure Earthquake

Richter Scale	*Mercalli Scale*
It is an instrument to measure magnitude of the earthquake	It is an instrument to measure the intensity of the earthquake
It measures magnitude from 0 to 10	It measures intensity from 1 to 12
Richter scale relates to the energy released during the earthquake.	Mercalli scale takes into account the visible damage caused by the earthquake.
It is a limitless scale	

Shadow Zone of Waves



Shadow zone of Earthquake

• The shadow zone of an earthquake is the area of the Earth, where certain seismic waves are not detected. The shadow zone of *S-waves (105°-105°)* is larger *(40% of Earth's surface)* than the shadow zone of *P-waves (105°-145°)*.

• Animals are sensitive to infrasonic waves, seismic p waves; therefore, they can sense natural calamities like earthquakes, tsunamis beforehand.

Effects of Earthquake

• Tsunami (Japanese term): These are *harbour waves*. It occurs when earthquake occurs at sea floor.

- Soil liquefaction
- Landslide
- Avalanche
- Floods
- Fire

- *The Indian Ocean Tsunami of 2004, also known as the "Boxing Day Tsunami", happens to be the deadliest tsunami to date.*
- *On May 22, 1960, Chile got struck with the strongest earthquake in history (9.5 magnitude), also known as the Great Chilean Earthquake.*

Types of Earthquake

- ***Collapse earthquake:*** These are small earthquake that occurs when the roof of underground mine or caverns collapse.
- ***Explosion earthquake:*** An earthquake caused by detonation of a chemical or nuclear device.
- ***Tectonic earthquake:*** An earthquake caused by movement of earth's tectonic plates.
- ***Reservoir induced earthquake:*** An occurrence of earthquakes caused by construction of large reservoirs. This is human-induced earthquake. **Eg. 1967 Koyna Dam earthquake (Maharashtra)**.
- ***Volcanic earthquake:*** An earthquake that occurs as result of volcanic eruption.

Earthquake caused in BHUJ (Gujarat) in 2001 with a magnitude of 7.7

Earthquake Zones

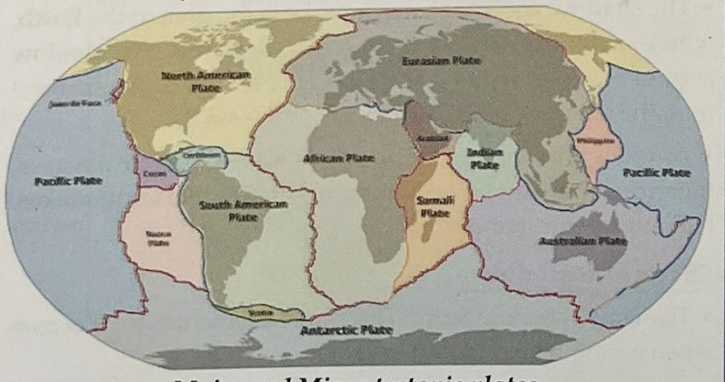
- Zone V (highest)
- Zone IV
- Zone III
- Zone II (least active)

Earthquake zones in India

Tectonic Plates

- Lithosphere makes plates comprising crust and upper solid part of Mantle.

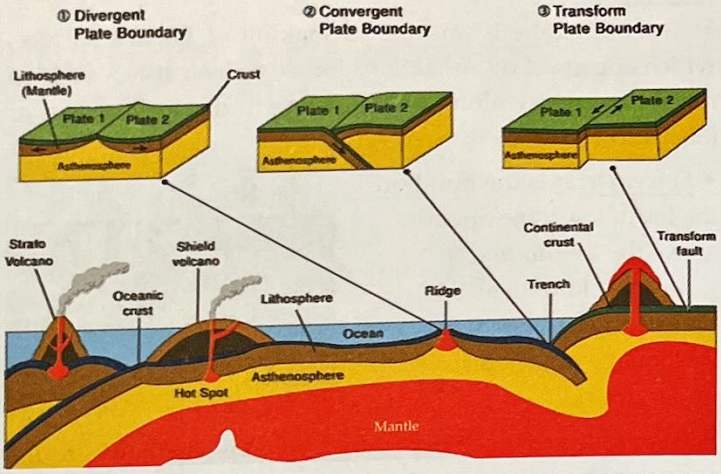
There are 7 major + few minor plates.



Major and Minor tectonic plates

Major Tectonic Plates	*Minor Tectonic Plates*
• Pacific plate **(Largest)**	• Cocos plate
• North American plate	• Nazca plate
• South American plate	• Caribbean plate
• African plate	• Indian plate
• Antarctic plate	• Philippine plate
• Eurasian plate	• Juan de Fuca plate **(Smallest)**
• Australian plate	

Three Types of Plate Boundary



Divergent	*Convergent*	*Transform*
Occurs when two tectonic plates move away from each other, causes lava to explode, *leading to new crust formation.*	It happens when plates collide, causing one plate to subduct beneath the other creating a subduction zone, potentially *destroying the crust.*	It is a plate boundary where plates slide past each other, *neither creating nor destroying crust and hence Conservative in nature* **(San Andreas Fault)**.

- Divergent plate boundary of two oceanic plates forms mid oceanic ridge, but divergent plate boundary of two continental plates forms Rift valley with block mountains on both sides, like the **African Rift Valley**.
- At convergent boundaries, dense oceanic crust subducts beneath continental crust, forming trenches and uplifting mountains. Melting of the subducting plate produces magma that rises, creating volcanic chains near the mountains.
- But in case of the Indian plate and Eurasian plate, as both are continental crusts, no major subduction took place, the plates got folded to form the Himalayas (As no subduction occurred here, no volcanoes formed nearby).

Ring of Fire

- It is a result of Convergent Plate Boundary. It is a *horse-shoe-shaped* region around the *Pacific Ocean.* It is a *high earthquake (90%) and volcano prone region (75%).*

FORMATION OF ROCKS

• **Petrology:** The study of rocks is called Petrology.

• Rocks do not have definite composition of mineral constituents.

Age of rocks is calculated using Carbon Dating.

Igneous Rocks

• The word "Igneous" derived from the Latin word "*Ignis*" which means "*fire*".

• Igneous rocks (also called "Azoic", as no fossils are found in them) are formed through the cooling and solidification of molten rock, known as *magma or lava.*

Two Types of Igneous Rocks

Intrusive Igneous Rocks/ Plutonic Rocks	*Extrusive Igneous Rocks*
When the magma cools and solidifies slowly within the Earth's crust, it forms intrusive igneous rocks.	When the magma erupts on the Earth's surface as lava, it cools and solidifies quickly. This rapid cooling results in the formation of small crystals or glassy texture.
Eg. *Granite, Gabbro, etc.*	Eg. *Basalt, Pumice (it floats on water), etc.*

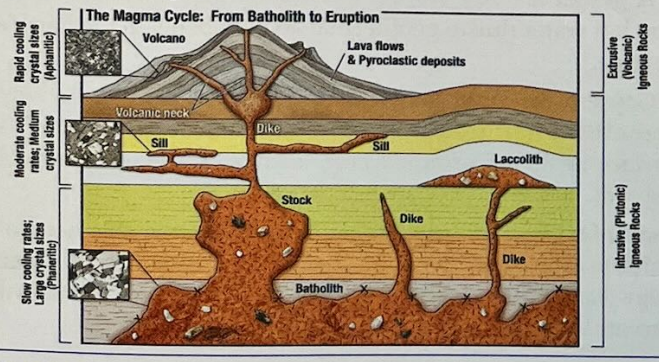
Plutonic Bodies

Plutonic bodies, also known as plutons, are *large bodies of intrusive igneous rock* that form beneath the Earth's surface.

Types of Plutonic Bodies

- ***Batholiths***: A batholith is a large *mass of igneous rock* that forms deep within the Earth's crust and is exposed at the surface through erosion and uplift.
- ***Dykes***: Dykes are vertical or *steeply inclined sheets of magma* that cut across the layers of surrounding rock.
- ***Sills***: Sills are horizontal sheets of magma that intrude between layers of pre-existing rock.
- ***Phacolith***: A phacolith is a *lens-shaped igneous rock pluton* that forms in folded sedimentary rock found at *Anticlines* and *Synclines*.
- ***Laccoliths***: *Dome-shaped intrusions* with a flat base that push overlying layers upward.

  It is connected by a *pipe-like structure Conduit*.
- ***Lapoliths***: These are *saucer-shaped intrusions* with concave top and bottom.



SEDIMENTARY ROCKS

• Sedimentary rocks are a type of rock that forms from the *accumulation and consolidation of sediments* over time.

• *Lithification* is a process by which loose sediments are transformed into solid sedimentary rock. This occurs through a combination of *compaction and cementation* over long periods of time.

• They exist in layers/strata.

Types of Sedimentary Rocks

1. ***Mechanically/Clastically formed:*** Sandstone, limestone, conglomerate, shale, loess, etc.
2. ***Organically formed:*** Chalk, limestone, coal, geyserite, etc.
3. ***Chemically formed:*** Limestone, halite, chert, etc.

• *Fossils are found in sedimentary rocks.*

METAMORPHIC ROCKS

• Metamorphic rocks are rocks that form when existing rocks (igneous, sedimentary, or even other metamorphic rocks) are subjected to *intense heat, pressure, or volume change*, causing them to undergo physical and chemical changes. This process is also called *Metamorphism*.

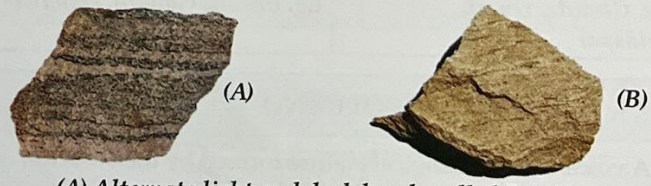
• These rocks are formed by recrystallisation and reorganisation of materials within the original rocks.

Two Types of Metamorphic Rocks

Thermal Metamorphism	*Dynamic Metamorphism*
These are formed due to *sudden temperature change.*	These are formed *without any chemical change*. Generally formed as a result of *high pressure.*

Types of Thermal Metamorphism

Contact Metamorphism	*Regional Metamorphism*
It occurs when rocks are altered by intense heat due to their proximity to magma or lava.	It occurs when rocks are subjected to *high pressure and temperature*.



(A) Alternate light and dark bands called Banding;
(B) Lines formed called Lineation/foliation

• *Quartz is not a rock, it is a mineral.*

- *Taj Mahal is made of : Marble (metamorphic rock).*
- *Red Fort is made of: Red sandstone (sedimentary rock).*

Granite (Igneous) —Metamorphism→ **Gneiss**

Shale (Sedimentary) —Metamorphism→ **Slate, Schist**

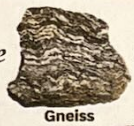
Sandstone (Sedimentary) —Metamorphism→ **Quartzite**

Limestone (Sedimentary) —Metamorphism→ **Marble**

Basalt/Gabbro (Igneous) —Metamorphism→ **Amphibolite**

Clay (Sedimentary) —Metamorphism→ **Slate**

- *Granite: Found in Continental crust.*
- *Basalt: Found in Oceanic crust.*


Gneiss

Marble

Phyllite

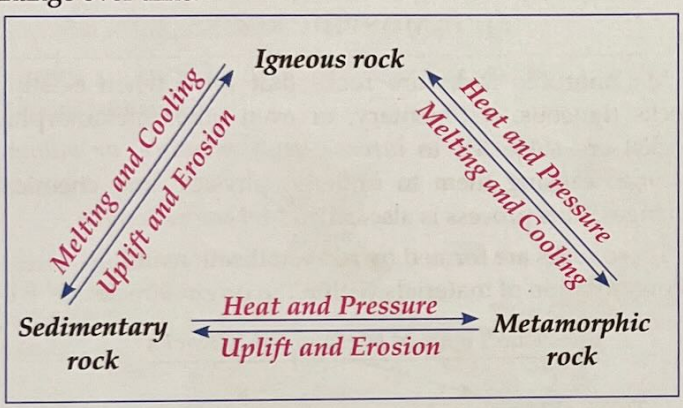
Slate

Quartzite

Limestone

Rock Cycle

- It is a geological process that describes how the three main types of rock: igneous, metamorphic, and sedimentary change over time.



Acidic vs Basic Rocks

Acidic Rocks	Basic Rocks
They are high in silica (mostly feldspar and quartz minerals) upto 80%	They are poor in silica (mostly feldspar and quartz minerals) about 40%
They are light in color	They are dark in color
Due to high silica content, acidic magma cools faster	Due to low silica content, basic magma cools slowly
They are formed from acidic lava (Felsic in nature - high in Silica & Feldspar) which is viscous in nature.	They are formed from basic lava (Mafic in nature - high in Magnesium & Iron) which is fluid in nature.
Eg. *Granite, Quartz, Feldspar*	Eg. *Basalt, Gabbro, Dolerite*

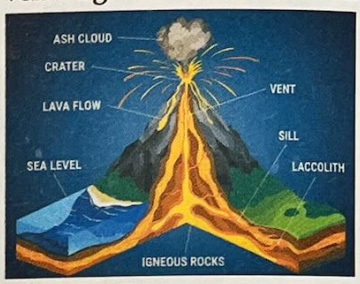
VOLCANO

- A volcano is a geological feature formed by the *eruption of molten rock (magma)* from beneath the Earth's crust.
- On the basis of frequency of lava eruption, Volcanoes can be categorised in 3 types:

1. ***Active Volcano:*** A volcano that is currently erupting or has erupted recently and may erupt again in the future.
2. ***Dormant volcano:*** A volcano that has not erupted for a long time but may erupt again in the future.
3. ***Extinct volcano:*** A volcano that has not erupted for thousands of years and is not expected to erupt again.

Types of Volcano

1. ***Cinder cone:*** They are *small, steep-sided* volcanoes formed by moderately explosive eruptions and erupts more pyroclastic debris than lava.
2. ***Flood Basalt Province:*** These volcanoes outpour, highly fluid lava that flows for long distances. **Eg.** ***Deccan Traps (in West Central region).***
3. ***Shield:*** They are primarily formed by eruption of *basaltic lava* which is *non-viscous fluid*. They become explosive when water enters their vent. **Eg.** ***Kilauea Volcano in Hawaii, USA.***
4. ***Composite:*** They are generally *cooler and viscous* in nature. They are also known as *Stratovolcano*. **Eg.** ***Mt. Chimborazo and Mt. Fuji.***



5. ***Caldera:*** It is the *most explosive* type of volcano, it collapses on itself, which means their magma chamber is in close vicinity.
6. ***Fissure volcano:*** They have an elongated vent or crack formed by divergent plate boundary, through which lava erupts. It doesn't have a hill or mountain-like structure like other volcanoes but shows volcanic activity.
7. ***Arc Volcanoes:*** Volcanoes formed in the ocean due to convergent plate boundary.

Highest volcano: Ojas del Salado (it is located between Chile and Argentina in Andes mountain range).
Lighthouse of Mediterranean: Mount Stromboli
Largest volcano by volume - Mauna Loa, Hawaii.

Volcanic hotspots

- Generally volcanoes are formed between plate boundaries but some volcanoes are formed within the plates and their source of magma is outer core not asthenosphere.

Example: Hawaiian volcanoes like Mauna Loa, Mauna Kia etc are hotspot volcanoes and they're not connected to the Pacific ring of fire.

Geyser

- A geyser is a *hot spring that intermittently erupts steam* and hot water due to geothermal activity beneath the Earth's surface.
- Geysers are commonly found in areas of volcanic activity because the heat from magma or hot rocks below the Earth's surface heats the groundwater, leading to the formation of geysers.

Example: Old faithful geyser in the USA (near this hotspot volcanism can be seen in Yellow Stone National Park), Puga Valley in Ladakh, Manikaran in Himachal Pradesh (at Parvati Valley).

CONTINENTS AND OCEANS

• *In 1912, Alfred Wegener gave Continental Drift Theory.*

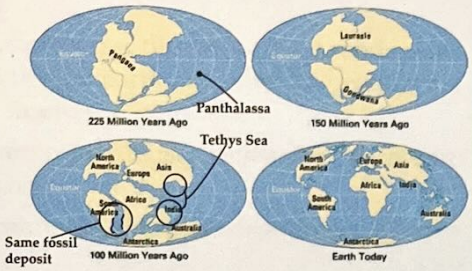
• All of the modern day continents had previously been clumped together in a supercontinent called *Pangaea* and the water body is called *Panthalassa.*

Evidences

• **Jig-saw fit.**

• **Fossil deposits** (Paleontology is the study of Fossils).

• **Botanical evidences.**



• **Rocks of same age** across the oceans.

• **Ghana gold deposit (Placer deposits)-** Gold deposits in Ghana were connected to the Brazilian plateau, when two continents laid side by side. As a result, even though the gold deposits are found in Ghana & South African region, the gold veins still remained in South America.

• **Gondwana System Sediments:** The Gondwana system of sediments (sedimentary rock that is deposited directly by glacial ice, called *Tillite deposits*) from India has counterparts in six other southern landmasses: Africa, Australia, Antarctica, Madagascar, South America, and the Falkland Islands.

Reason for Continental drift

1. *Tidal force*
2. *Pole fleeing force*

} As suggested by Alfred Wegener

• Actual reason was later given by *Arthur Holmes in 1930* (Convection Current Theory) which states that continental drift occurs due to the movement of tectonic plates, which is driven by convection cells in the Earth's mantle.

• The heat that drives *convection cells in the Earth's mantle* and plate motion comes mainly from three sources:

1. *Radioactive decay* of elements (causing thermal differences).
2. *Residual heat* from the Earth's formation about 4.6 billion years ago when gravitational energy was converted into heat.
3. *Latent heat* released by the solidification of the Earth's core as it cools down.

Milankovitch Theory

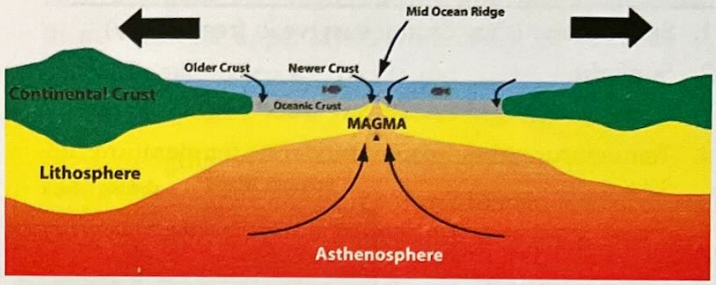
• It describes the collective effects of changes in Earth's movement on its climate over thousands of years.

• In *1596, Abraham Ortelius's* work, *"Thesaurus Geographicus"*, first suggested that Earth's continents were not always in their current locations.

SEAFLOOR SPREADING

• *Harry H. Hess in 1962, gave Seafloor Spreading Theory.*

• Seafloor Spreading is a process by which new oceanic crust is formed at mid-ocean, due to divergent plate boundary. The magma erupts from beneath pushing the older crust away from the ridge in the centre.



• Rocks equidistant from the mid oceanic ridge are of equal age, and their age increases as you move farther away from the ridge.

• Oceanic crust is younger than continental crust.

Relief features are of two types:

1. *Major Relief Features*

Four major relief features are there:

Continental Shelf → Continental Slope → Continental Rise

Abyssal plain/Deep sea plains

2. *Minor Relief Features*

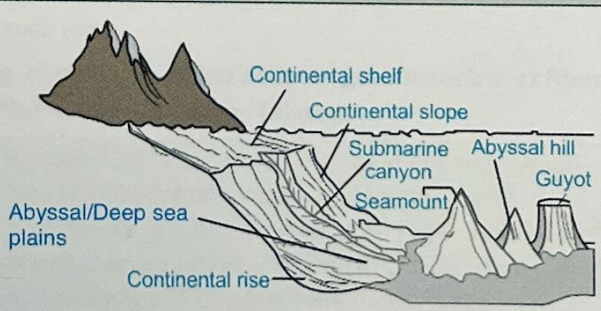
Eg. *Seamount, Guyot (flat-topped seamount), Mid-Ocean ridge, Trench, Coral, Atoll, etc.*

• The *Mid-Atlantic Ridge* is a mid-ocean ridge located along the floor of the *Atlantic Ocean*, and *part of the longest relief feature in the world.*

• It got created due to divergent plate boundary.

• Continental Shelf is the shallowest part of the ocean, having a gradient of 1 degree or less.

• The gradient of the Continental Slope region varies between 2° - 5°.



Relief Features of Ocean

Corals

- Corals are marine organisms known as *"Rainforest of Sea"*.
- They exist in symbiotic relationship with *Zooxanthella* algae. The corals secrete $CaCO_3$ that provides protection to the algae and in return the algae make food for the corals.
- Corals exists in colonies.

Favourable Conditions Required for Corals to Survive

1. Saline water (they cannot survive in fresh water).
2. Sunlight.
3. Clear water.
4. Temperature (they require moderate temperature: 20°-32°C).

Atoll: An atoll is a ring-shaped coral island or reef surrounding a central lagoon, formed from the growth of coral around a sinking volcanic island.

Great Barrier Reef in Australia is the largest barrier reef (colony of corals) in the world.

Coral Bleaching

- When water is *too warm, corals will expel the algae* (Zooxanthella) living in their tissues, causing the coral to turn completely white. *Climate change is a major key factor in this change.*

FACTS

- *Mariana Trench* is the deepest part of the *Pacific Ocean (11 km).*
- *Challenger Deep* is the *deepest known point in Mariana Trench.*
- Atlantic Ocean is the *busiest* ocean. *Sargasso Sea* is a unique region in the Atlantic Ocean, which is a *borderless sea (brown algae Sargassum is seen here).*

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GEOMORPHOLOGICAL PROCESS

- **Father of geomorphology-** *William Morris Davis.*
- Geomorphology is a scientific discipline, concerned with description and classification of earth's topographic features. All geomorphologic process occur due to two types of forces: *Endogenic Forces (internal) and Exogenic Forces (external).*

Endogenic Processes

- These are geological processes that occur due to endogenic forces. All relief features on earth are subject to endogenic and exogenic forces. **Example-**
- ***Himalayas:*** They are continuously *increasing (endogenic forces > exogenic forces).*
- ***Aravali:*** They are continuously *decreasing (exogenic forces are > endogenic forces).*
  - Endogenic forces get their energy from within the earth (recall Convection Current Theory).

Effects of Endogenic Forces

1. **Diastrophism:** It is a process of *deformation and movement* of Earth's crust. These movements are responsible for shaping large-scale landforms over geological time periods.

Types of Diastrophism

a) Orogenic Process: It is a process through which mountains are built.

b) Epeirogenic Process: It involves upliftment or warping of large parts of the Earth's crust.

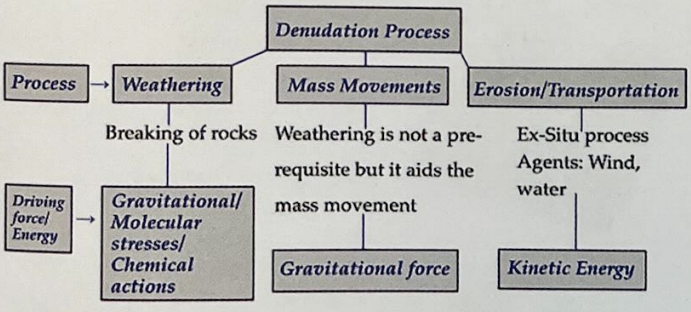
c) Earthquake: It involves shaking of Earth.

d) Plate Tectonics: It explains how major landforms are created as a result of Earth's subterranean movements.

2. **Volcanoes:** They are commonly described as openings/ vents where lava or magma erupts.

Exogenic Processes

- These are geological processes that occur on the Earth's surface due to external forces (exogenic forces).
- *Denudation* refers to long-term processes that cause the wearing away of earth's surface, leading to a reduction in elevation and relief of landforms and landscapes.
- ***Exogenic agents are: Wind, glaciers, water.***
- *Source of energy* for exogenic forces is the Sun.



Weathering

- Weathering is the process of rocks and minerals breaking down or dissolving on the Earth's surface.

Types of Weathering

1. *Physical Weathering:* This involves the breakdown of rocks and soils *through direct contact* with atmospheric conditions, such as *heat, water, ice, and pressure.*
   Examples-

   Unloading and Expansion- When rocks deep inside the Earth are under very high pressure from the layers above them. When the upper layers erode away, the pressure decreases and the rock expands and cracks, forming sheets. **Eg. Large granite rocks cracking into layers.**

   Frost Wedging- Water enters small cracks in rocks. When temperature drops, the water freezes and expands. This expansion pushes the rock apart, and repeated freezing and thawing eventually breaks the rock. **Common in: Cold mountainous areas.**

   Salt Crystallisation- Salt water enters tiny cracks in rocks. When the water evaporates, salt crystals remain and grow inside the cracks. The growing crystals exert pressure and break the rock apart. **Common in: Coastal areas and deserts.**

2. *Chemical Weathering:* This involves the decomposition of rocks and soils *through chemical reactions*, such as *oxidation and reduction, carbonation, solution*, and *hydration.*

   Solution: Occurs mainly in soft rocks which are made up of soluble minerals **Eg.** Nitrates, Sulfates, Potassium, and these get dissolved in water or acid or leaching takes place.

   Eg. solution process can be seen in limestone where the $CaCO_3$ gets dissolved.

   Hydration: Occurs in rocks made up of minerals that absorb water and expand, causing the rock to weaken or change into a new mineral.

3. *Biological Weathering:* It is also known as *organic weathering*, is the breakdown of rocks and soils through the activities of living organisms such as earthworms, rodents, etc.

Weathering is an in-situ process.

Effects of Weathering

1. *Exfoliation:* It is a process when large, curved plates, or slabs of rocks are stripped away from the outer surface of a rock mass.

   Eg. a large exfoliation dome in granite rock near Bhongir (Bhuvanagiri) town in Telangana.

Tor: **Rounded hill like structure formed due to physical weathering (exfoliation), generally in granite rock.**
[The exfoliation first turns a giant rock to an exfoliation dome, and after sometimes the rate of exfoliation declines, giving it a stable hill like structure that's Tor]

2. ***Mass Movements:*** It is the downslope movement of soil, rock, and other debris under the influence of gravity. Weathering is not a prerequisite.

   Types:

   1. ***Rapid:*** Landslides (due to deforestation), avalanche, earthflow, mudflow (leads to soil liquefaction).
   2. ***Slow:*** Creep (slow down slope movement of particles), solifluction (slow progressive movement of mass down a slope seen mainly in temperate regions).

Erosion: It involves transportation of rock debris through geomorphic agents like running water, groundwater, glaciers, winds and waves.

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LANDFORMS

• Landforms are natural or human-made features on the Earth's surface. They include hills, mountains, plains, and more. The landforms are formed due to various agents such as river, glaciers, wind, sea waves, groundwater, etc.

Types of Landforms

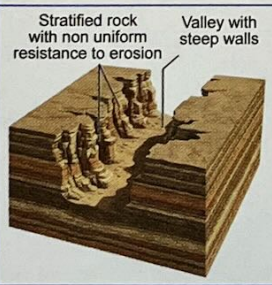
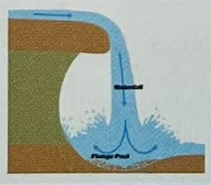
1. **Erosional Landforms:** They are created by the process of erosion.
2. **Depositional Landforms:** These are created when sediments are deposited in areas of reduced flow energy.

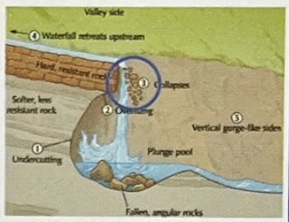
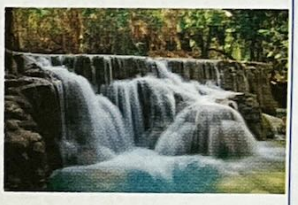
Landforms Created by River

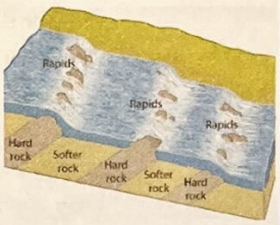
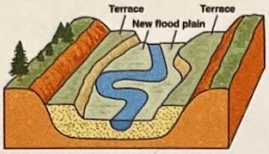
• A river goes through three stages: *Youthful, mature, and old*. The course of a river includes *the upper stage, the middle stage, and the lower stage.*

Youthful Stage	*Mature Stage*	*Old Stage*
River flows with high *speed.* **Eg.** ***V-shaped valley, Gorges, Canyon, Waterfalls, Entrenched meander***	The river flows from *high gradient to flat plain.* **Eg.** ***Meanders***	The final stage of river's journey **Eg.** ***Ox-bow lakes, Delta, Flood plains***

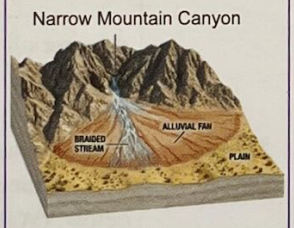
• **Erosional Landforms:**

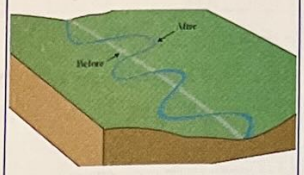
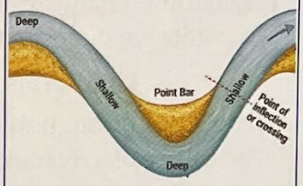
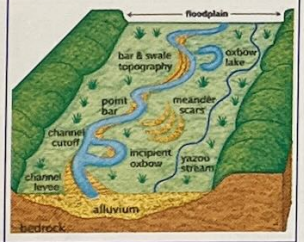
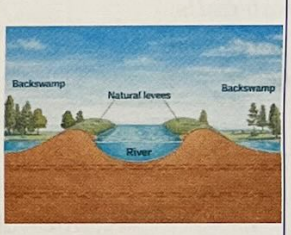
Landforms	*Definitions*	*Pictures*
V-shaped Valley	Narrow valley with steep sides formed by vertical river erosion.	
Gorge	Deep, narrow valley with very steep sides. Commonly developeds in hard, resistant rocks.	
Canyon	Large, deep gorge with layered rock sides. commonly form in horizontal sedimentary rock layers.	
Plunge pool	Deep hole created at the base of a plunge waterfall.	

Peneplain	A nearly level plain formed due to prolonged erosion, reducing the land almost to its base level.	
Waterfall	A sudden vertical drop in a river, mainly due to the erosion of soft rock, which creates a steep fall.	
Cataract Waterfall	When waterfall forms where hard rock and soft rock create an uneven river bed, causing heavy, turbulent flow.	
Cascade Waterfall	A waterfall that consists of series of small falls where water flows over rocks or boulders (multi-step waterfalls).	
Plunge Waterfall	A waterfall where water falls straight down without touching the cliff face below. (Water velocity is very high).	
Potholes	Round holes in the river bed formed by swirling pebbles. (The process of wearing away rocks by friction of particles carried by a river is called Abrasion).	

Rapids	Fast, turbulent rivers flow horizontally over alternating hard rocks (resilient rock) and soft rocks (less resilient rock) creating step-like structure.	
River terraces	Flat steps along a river valley that were once floodplains (areas where floods spread), but got left at a higher level when the river cut deeper into the land.	
Entrenched Meander	Generally found in mountainous regions, where a river cuts deep into rock when uplifted land blocks its path, forming steep-sided meanders.	

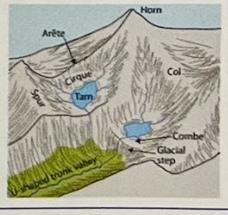
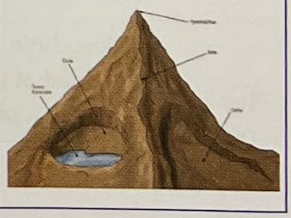
- **Depositional Landforms:**

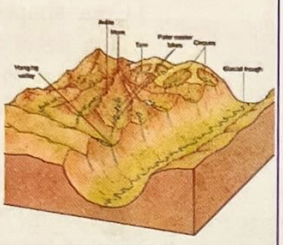
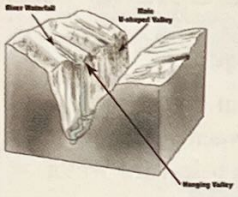
Landforms	*Definitions*	*Pictures*
Alluvial Fans	A fan-shaped deposit of sediments formed where a river slows down suddenly on leaving a mountainous region.	
Braided Channels	A network of interweaving river channels formed due to heavy sediment deposition within the river.	
Ox-Bow Lake	A crescent shaped lake formed from a cut-off meander due to deposition sealing the ends.	

Meanders	Bends or loops in a river formed due to erosion on the outer bank (concave bank) and deposition on the inner bank (convex bank/point bar).	
Point Bars	Deposition of sediments on the inner side (convex bank) of a meander bend due to slower flow of water.	
Flood Plains	Broad, flat areas along a river, formed by the deposition of fine sediments (alluvium) during repeated floods.	
Levees	Raised embankments along river banks formed by deposition of heavier sediments during floods.	

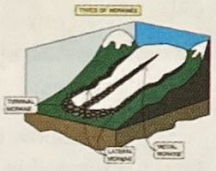
Landforms Created by Glaciers

- **Erosional Landforms:**

Landforms	*Definitions*	*Pictures*
Cirque	A bowl-shaped, steep-sided hollow formed at the head of a glacier due to erosion.	
Tarn Lake	A small lake formed when water fills up in a cirque.	
Arete (Ridges)	A sharp, narrow ridge formed between two adjacent cirques due to glacial erosion.	

Horn	A pointed, pyramid-like peak formed when three or more cirques erode a mountain from different sides.	
U shaped/ Glacial Valley	A wide, flat-bottomed "U" shaped valley with steep sides formed by glacier movement. (unlike narrow V-shaped river valleys).	
Hanging Valley	A smaller valley left above the main U-shaped glacial valley (often giving rise to waterfalls).	
Fjord	When sea water enters into the glacial valley.	

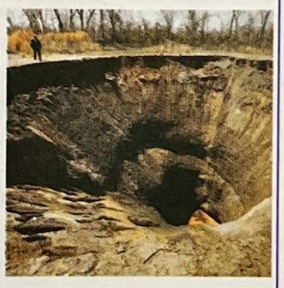
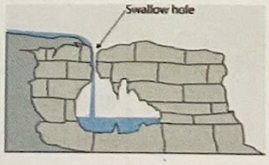
- **Depositional Landforms:**

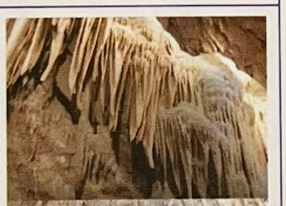
Landforms	*Definitions*	*Pictures*
Moraines	Deposition of unsorted glacial debris (till) along the sides of a glacier.	
Eskers	A long, sinuous ridge of sand and gravel deposited by melted glacial water streams flowing beneath the glacier.	
Outwash Plains	A gently sloping plain of well-sorted sand and gravel deposited by glacial meltwater beyond the glacier.	
Drumlins	An elongated, oval-shaped hill composed of glacial deposits (till), with its long axis parallel to ice flow. The upstream blunt end is called the stoss end and the downstream long & pointed end towards the flow of ice is called the tail or lee end. (Also known as "*Basket of eggs topography*").	

Landforms Created by Groundwater (also known as Karst *Topography)*

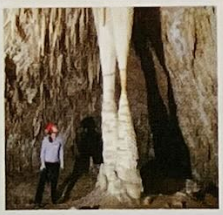
- The term "Karst" is derived from the Karst Plateau, which is located in south-western Slovenia and extends into north-eastern Italy.
- These are formed due to the solution (weathering) of soluble rocks like limestone and dolomite, which are rich in *calcium carbonate*.
- Since these rocks and such landforms are widely found in the Karst plateau region, all such groundwater landforms are called karst topography.
- Karst Topography location in India- Madhya Pradesh, Andhra Pradesh, Telangana, Odisha, and parts of the Himalayas.

- **Erosional Landforms:**

Landforms	*Definitions*	*Pictures*
Sinkholes	Depressions formed on the surface due to the solution or collapse of limestone, allowing water to drain underground.	
Swallow holes	Openings in limestone surface, through which streams disappear underground.	

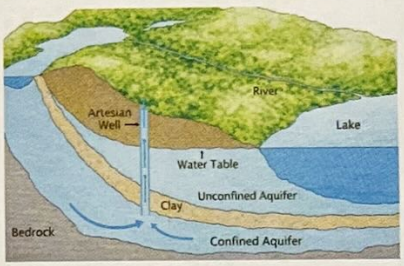
Dolines	Sinkhole enlarges due to continued solution of limestone by groundwater, forming a larger, circular or oval depression, called doline.	
Uvalas	A large, widespread, irregular depression formed by the joining or merging of several sinkholes or dolines is called uvala *(Sink valley)*.	
Lapies	Irregular grooves and ridges on limestone surface formed due to the dissolving action of water.	
Limestone pavements	flat, widespread limestone surface broken into blocks due to solution along joints by groundwater.	
Caves	Underground hollows formed by the solution action of groundwater in limestone rocks (often containing stalactites and stalagmites - the depositional landforms).	

- **Depositional Landforms:**

Landforms	*Definitions*	*Pictures*
Pillars	A vertical structure formed when a stalactite and stalagmite join together.	
Stalactite	Elongated deposits of calcium carbonate hanging from the roof of caves, formed by dripping water. Hanging from the ceiling.	
Stalagmite	Cone-shaped deposits of calcium carbonate rising from the floor of caves, formed by accumulation of dripping water. Rising from the ground.	

- **Aquifer:**

Groundwater stored between layers of hard rock below the water table.

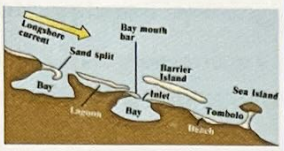
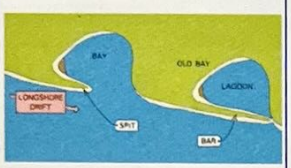
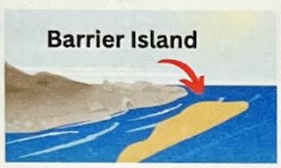
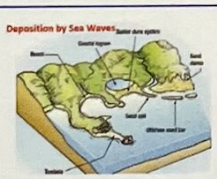


Landforms Created by Sea Waves

- **Erosional Landforms:**

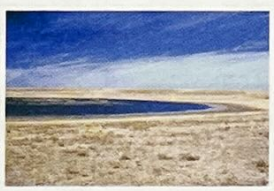
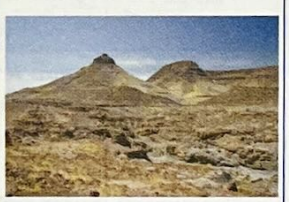
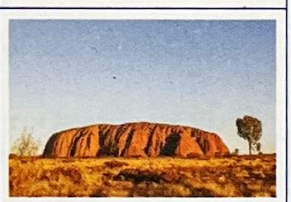
Landforms	*Definitions*	*Pictures*
Sea Cliff	A steep rock face along the coast formed by continuous erosion by sea waves.	
Sea Caves	A hollow or cavity formed in coastal rocks due to continuous wave action along weak zones.	
Sea Arch	An arch-shaped opening formed when waves erode through a headland or cave.	
Sea Stack	An isolated, steep rock pillar in the sea formed when part of an arch collapses.	

- **Depositional Landforms:**

Landforms	*Definitions*	*Pictures*
Beaches	An accumulation of sand, pebbles, and other sediments along the shore deposited by sea waves.	
Spits	A narrow, elongated ridge of sand projecting into the sea, formed by longshore drift.	
Bars	A ridge of sand deposited across a bay or river mouth, often cutting it off from the sea.	
Barriers	A long, narrow offshore ridge of sand running parallel to the coast, formed by wave deposition.	
Lagoon	A shallow water body separated from the sea by a bar or spit.	
Tombolo	A ridge of sand or other deposits connecting an island to the mainland.	
Coastal sand dunes	Mounds or ridges of sand formed near the coast are called coastal dunes.	

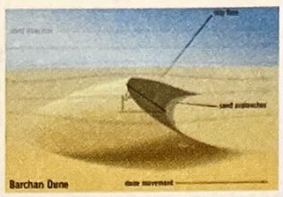
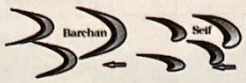
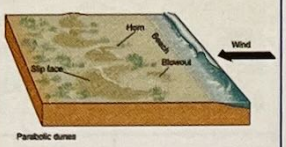
Landforms Created by Wind ***(also known as Aeolian Landforms)***

- **Erosional Landforms:**

Landforms	*Definitions*	*Pictures*
Yardang	Long, narrow ridges separated by grooves, formed due to wind erosion along the direction of prevailing winds.	
Mushroom rocks	A rock with a narrow base and broad top, formed due to faster erosion of lower soft rock layers than upper hard rock layers by wind (Also known as pedestal rocks).	
Zeugen	Tabular rock masses with a flat top and steep sides, formed due to differential wind erosion of hard and soft rock layers.	
Playa	A shallow, flat-floored depression in desert regions where water collects temporarily and dries up, leaving behind salts and fine sediments.	
Pediplain	A broad, nearly level erosional surface formed after prolonged erosion in arid regions by the merging of several pediments.	
Inselberg (Monadnock)	An isolated, steep-sided residual hill rising abruptly in a pediplain region.	

- **Depositional Landforms:**

Landforms	*Definitions*	*Pictures*
Sand dunes/ Loess	When the grains of sand are very fine and light, the wind can carry it over a very long distance, such sand gets deposited in large areas and is called Loess or sand dunes.	

Barchans	Crescent shaped dunes whose points or wings are directed away from wind direction. They are found in Jaisalmer, Rajasthan.	
Seif	Similar to Barchans with only one wing.	
Parabolic dunes	Sand dunes (also in crescent shape) form opposite to wind's direction, mainly because of the presence of vegetation.	
Transverse dunes	Sand dunes formed perpendicular to the direction of wind.	
Longitudinal dunes	Sand dunes formed parallel to the direction of wind.	
Oasis	Small fertile land with water source in arid region.	

ATMOSPHERE

• The atmosphere is a mixture of gases surrounding Earth, held in place by Earth's gravity.

Evolution of the Atmosphere

1. ***Loss of Primordial Atmosphere:*** Initially composed of hydrogen and helium, however this atmosphere was lost due to excessive solar flares.
2. ***Volcanism:*** The hot interior of Earth released gases through volcanic eruptions to form a new atmosphere (Degassing).
3. ***Biological Modification:*** Plants and living organisms played a key role in further transforming the atmosphere through Photosynthesis.

DIFFERENT LAYERS OF ATMOSPHERE

Troposphere → (Tropos: Region of mixing)

• Troposphere is the lowest layer of Earth's atmosphere.

• All weather phenomena (rain, storms, clouds, etc.) occur in this layer.

- **Nitrogen (N_2):** 78%
- **Oxygen (O_2):** 21%
- **Argon (Ar):** 0.9%
- **Carbon dioxide (CO_2):** 0.036%
- **Neon (Ne):** 0.0018%
- **Helium (He):** 0.00052%

Composition of Gases

Height variation

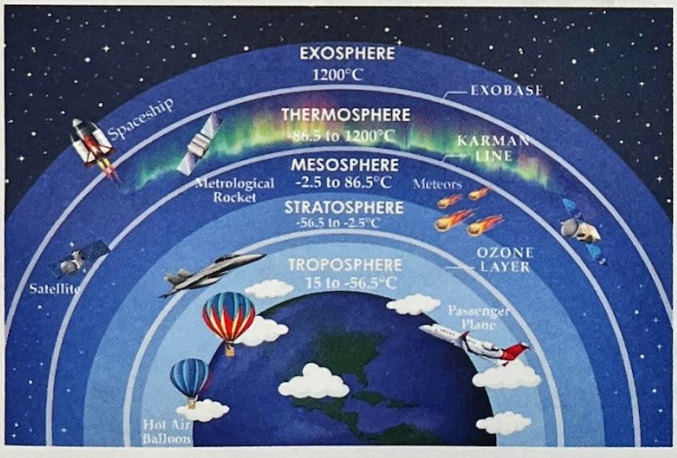
- **At poles:** 8 km
- **At equator:** 18 km

} *Average:* 13 km

Temperature at Tropopause
- *At Equator: -80°C*
- *At Poles: –45°C*

• A ***tropopause*** is a line that separates Troposphere from Stratosphere.

• As we move upwards in the atmosphere, the density of the air decreases, and that is why the densest air is found in Troposphere.



• ***Lapse rate*** is the rate at which temperature decreases with altitude in the atmosphere.

Standard Lapse Rate

• 165 meters → 1°C decrease

• 1 km → 6.5°C decrease

• **Reason for temperature drop:** The atmosphere doesn't heat directly from solar radiation (insolation). Instead, the Earth's surface absorbs solar energy and re-emits it as long-wave infrared radiation (terrestrial radiation). This radiation warms the air near the surface.

As altitude increases, the air receives less terrestrial radiation, so the temperature drops with height.

- *Negative Lapse Rate - Temperature increases with altitude.*
- *Positive Lapse Rate - Temperature decreases with Altitude.*

Effects of Insolation

• ***At Equator:*** Insolation is less here, *due to presence of clouds.*

• ***At Tropics:*** Insolation is maximum here *due to minimal cloud covering.* **Eg.** *Desert.*

Factors influencing Insolation include:

1. *Transparency of the atmosphere*
2. *Length of the day*
3. *Earth's tilt and Rotation*
4. *Latitude*
5. *Altitude*
6. *Position of Earth*
7. *Surface reflection (Albedo)*

Key Greenhouse Gases

• Greenhouse gases keep earth warm by trapping heat in the atmosphere.

• *Key greenhouse gases: Water vapor, CO_2, CH_4(Methane), N_2O (Nitrous Oxide), O_3(Ozone).*

Heat Transfer Mechanism

• *NO_2 and SO_2 are not a Greenhouse gas.*

• The transfer of heat in the atmosphere occurs through three primary mechanisms: *Conduction, Convection, and Advection.*

• ***Conduction:*** The process by which heat is transferred directly from one molecule to another without actual movement of air.

• ***Convection:*** The vertical transfer of heat through the movement of air masses.

• ***Advection:*** The horizontal transfer of heat due to the movement of air. **Eg.** Loo is a result of advection.

Albedo

• Albedo refers to the proportion of incident light or radiation that is reflected by a surface.

• *Highest albedo* is seen in *ice caps* or *glaciers*.

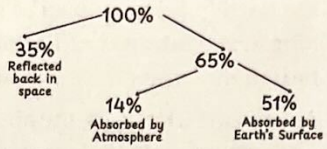
Albedo Values of Different Surfaces and Clouds

Earth surface	(%)	Clouds	(%)
Oceans, Lakes	8	Shallow broken clouds	30
		Cu, Ci, Cs, Cc	35
Land Surfaces	14-18	St	40
Sand, Desert	27	Thick clouds (Cs)	74
Ice and Snow	50 - 70	Ac, As, Sc	68
Sea ice	35	Cu	75
Old snow	59	Ns	85
Fresh snow	80	Cb	90
Asphalt (lowest)	5 - 10		

Heat Budget

• A heat budget is the balance between the heat that the Earth absorbs from the sun and the heat that it radiates back into space.

Heat Budget of Earth



Temperature Inversion

• A phenomenon where temperature increases with height instead of decreasing.

• Temperature inversion leads to stability, means - No Rain.

Favourable Conditions for Temperature Inversion

1. ***Long winter night:*** During long nights, the Earth's surface loses heat rapidly through radiation, cooling the air near the surface.
2. ***Still air:*** Calm and stable air prevents the mixing of cold surface air with warmer air above, maintaining the inversion layer.
3. ***Clear cloudless sky:*** Clear skies enhance heat loss from the surface through terrestrial radiation, promoting rapid cooling and inversion formation.

Stratosphere *(upto 50 km)*

• This layer of atmosphere contains the *Ozone layer (30-35 km* above Earth's surface), which protects from harmful *UV rays* (B and C).

• While moving upwards, *temperature increases with altitude,* due to the absorption of ultraviolet (UV) radiation by ozone, which releases heat and creates a stable thermal inversion.

• Jet planes fly in this layer.

• *Stratopause* divides Stratosphere and Mesosphere.

• UV- A rays which are less harmful mostly pass from the Ozone.

• *Ozone Day* **is celebrated on** *16 September* **to commemorate the adoption of the** *Montreal Protocol in 1987* **in** *Montreal, Canada.* **This international agreement aimed to phase out** *Chlorofluorocarbons (CFCs), which deplete the ozone layer and contribute to the formation of the ozone hole.*
• **Ozone layer thickness is measured in** *Dobson unit.*
• *Kigali Amendment* **was made to** *phase out HFCs (Hydrofluorocarbons).*

Mesosphere *(upto 85 km)*

• It is the *coldest* layer of atmosphere.

• *Meteors burn up in the mesosphere* because the air there is dense enough to compress and heat up in front of them, making their surfaces vaporize.

• While moving upwards, *temperature decreases with altitude.*

Thermosphere *(between 80-400 km)*

• It is the *hottest* layer of atmosphere.

• While moving upwards, *temperature increases with altitude.*

• It contains electrically charged particles known as *ions,* and hence, it is also known as the *ionosphere.*

• Radio waves transmitted from the earth are reflected back to the earth by this layer.

Karman Line

• It is an imaginary boundary located *100 kilometers (about 62 miles)* above sea level that *separates Earth's atmosphere from outer space.*

Exosphere

• It is the 5th and last layer of atmosphere. Mostly composed of *Hydrogen* and *Helium.*

• **Isotherm Line:** *These are lines or points on map/chart of the Earth's surface connecting points having same temperature at a given time.*

WATER ON EARTH

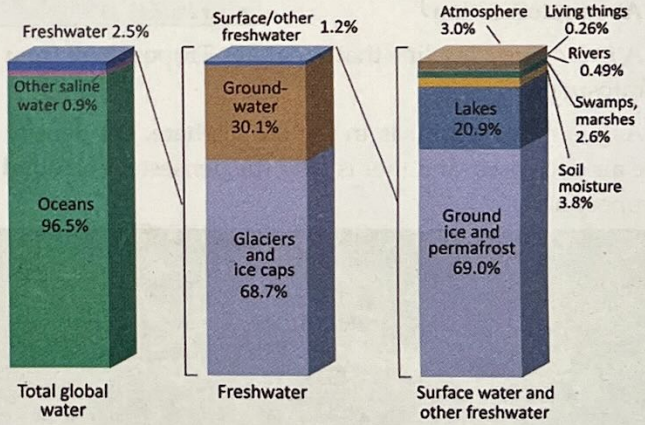
• *97.2%* of Earth's water is *saline*; only *2.8%* is *freshwater.*

• *Out of 2.8% freshwater: Ice caps/glaciers (2%), Groundwater (0.68%), Lakes (0.4%), Atmosphere, River.*

• *As a whole (Freshwater): Ice caps/glaciers (68.7%), groundwater (30.1%).*

- *71% of Earth's surface covered with water*
- *29% of Earth's surface is covered with land*

Where is Earth's Water?



Humidity

• Humidity is the concentration of water vapour present in the air.

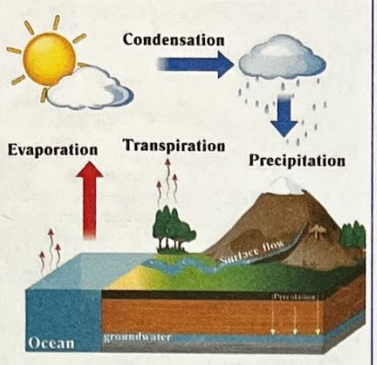
Types

1. ***Absolute Humidity:*** It is the *total mass of water vapor present in a unit volume* of air at a given temperature.

2. ***Relative Humidity:*** Actual moisture percentage compared to maximum capacity.

Absolute humidity is higher in warm air compared to cold air. This is because warm air can hold more water vapor due to its higher energy level.

Water Cycle



• Water cycle is the continuous *movement of water between the Earth's atmosphere and surface.*

Evaporation

• Evaporation is a process in the water cycle that *changes liquid water into water vapour.*

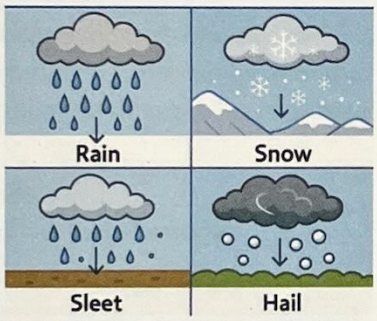
Latent Heat of Vaporization

• The amount of heat energy required to change a unit mass of a liquid into a gas at a constant temperature is called latent heat of vaporization.

Precipitation

• Precipitation is any *liquid or frozen water* that forms in the atmosphere and falls back to the earth *in the form of rain, snow or hail.*

Types of Precipitation



1. ***Rain:*** Liquid water droplet that fall when the air temperature is above freezing point.
2. ***Snow:*** Frozen water crystals that are formed when temperature is below freezing point.
3. ***Sleet:*** Small pellets of ice that forms when raindrops freeze before reaching the surface.
4. ***Hail:*** It is a type of precipitation that falls to the ground in the form of ice balls or lumps. Concentric rings are seen in Hailstone.

Condensation

• It is the process where water vapour (gas) becomes water (liquid).

Different forms:

• **Dew:** It is the moisture that form as a result of condensation.

• **Fog:** In winter, due to temperature inversion, cold air (which has low moisture-holding capacity) becomes saturated, and water vapour condenses near the ground, forming a low-level cloud called fog and has visibility *less than 1 km.*

In fog and mist, water vapor condenses around *hygroscopic nuclei* (aerosols like dust and smoke particles) instead of requiring a solid surface

• **Mist:** It is a phenomenon caused by small droplets of water suspended in the cold air, usually by condensation. Mist contains more moisture than fog, and has visibility *more than 1km.*

• **Frost:** It forms when water vapor (gas) directly turns into solid ice crystals without becoming liquid first.

> • *Radiation fog: Forms when the ground cools overnight and chills the air above it.* Eg. *Valleys and low-lying areas.*
> • *Advection fog: Forms when warm, moist air moves over a cooler surface.* Eg. *Coastal regions and plains.*

> • *Smog: Smog is a type of air pollution that results from the combination of smoke and fog.*

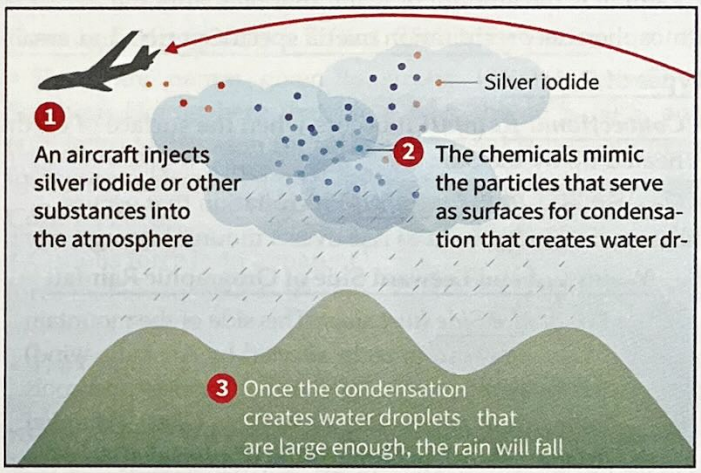
Dew Point

• The dew point is the temperature at which air becomes fully saturated with moisture, *causing water vapor to condense into liquid droplets* and it deposits on the surface.

• In winter air cools down due to which *dew point reduces,* water vapour condenses into water.

Cloud seeding

Cloud seeding is a weather modification technique that involves dispersing substances like silver iodide, dry ice, or salts into clouds to increase the amount of precipitation that falls, such as rain or snow.



CLOUDS

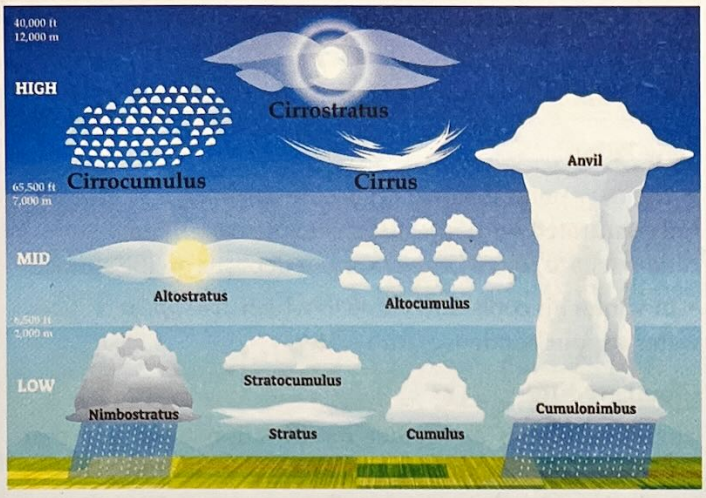
• Clouds are visible masses of tiny water droplets or ice crystals suspended in the Earth's atmosphere Clouds formed through the collision–coalescence process.

> • *Isoneph: Line drawn on map, connecting the points containing same amount of clouds.*

Different Types of Clouds

Clouds	*Features*	*Height*
Nimbus	Rain bearing; Opaque; Grey	Low-level
Stratus	Layered clouds	Low-level
Cumulus	Wool/Cauliflower shaped; flat base	4000-7000 m Middle level

Cirrus	Feather shaped clouds, do not cause rain	8000-12000 m High altitude
Cumulonimbus (anvil top)	Produce stormy weather that contribute to cyclones	Extensive vertical development



Rainfall

• Rainfall is the amount of water that falls from the atmosphere as precipitation over a specific period and area.

Types of Rainfall

• ***Convectional Rainfall*** It occurs when the surface of earth is heated up by the Sun.

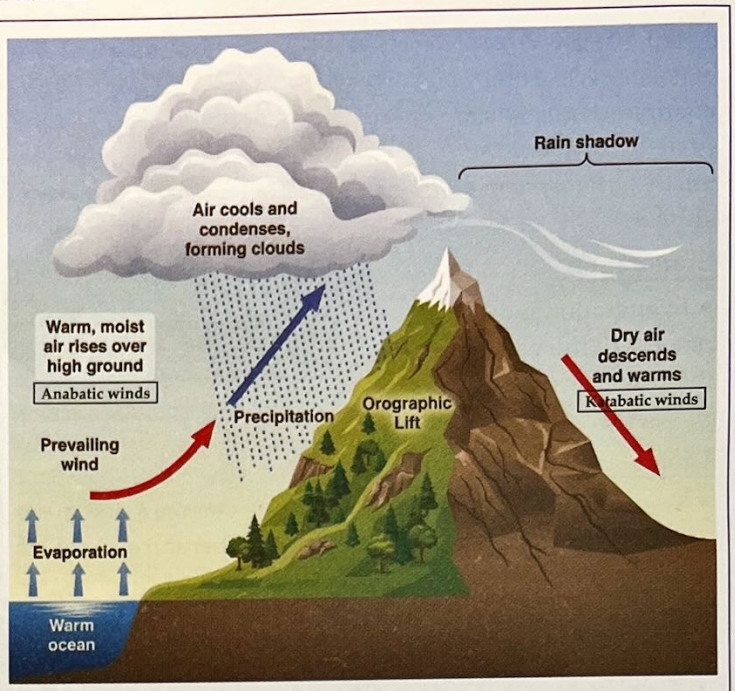
• ***Orographic / Relief Rainfall*** Precipitation that occurs when moist air is forced to rise over a mountain range.

Windward and Leeward Side of Orographic Rainfall

1. ***Windward Side (wet side):*** This side of the mountain facing the wind (mostly affected by Anabatic wind) receives the heavy rainfall as the air rises and cools there. **Eg.** ***Western sides of Western Ghats (Mumbai (Maharashtra) and Mangalore (Karnataka)).***
2. ***Leeward Side (dry side):*** This side of the mountain faces away from the wind (mostly affected by Katabatic wind) receives less rainfall because the air loses its moisture on the windward side before descending dry. It is also called a ***rain-shadow region***. **Eg.** ***Eastern side of Western Ghats (Vidarbh (Maharashtra) and Bangalore (Karnataka)).***

• ***Frontal/Cyclonic Rainfall:*** It is a type of precipitation that occurs ***when warm, moist air meets cold, dry air mass***.

Types of Rainfall



Windward and Leeward Side of Mountain

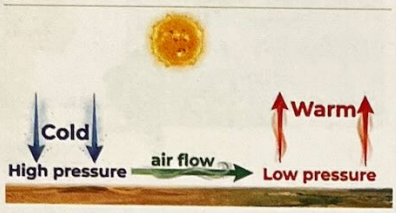
WIND AND PRESSURE DIFFERENCE

• *Wind* blows because of *differences in air pressure* in the Earth's atmosphere. Air moves from high pressure to low pressure. The sun heats the Earth unevenly, so some places get warmer than others. At the Equator, there is generally low air pressure due to the rising of warm and light air; while at the Poles, there is high air pressure because of the sinking of cold and dense air.

A wind is named based on the direction from which it originates.

Types of Wind

- Local Winds
- Permanent Winds



Movement of Air

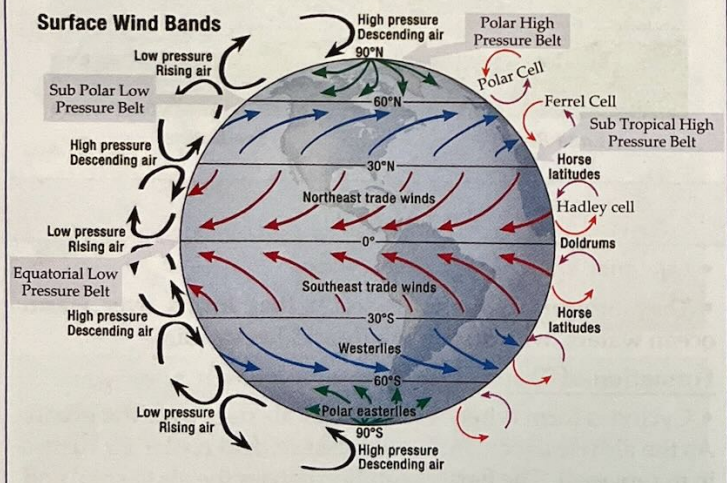
1. ***Local Winds:*** Local winds are winds that blow over short distances and are typically caused by *local geographic features and temperature differences* in specific areas.

2. ***Permanent Winds:*** Permanent winds, also known as planetary winds, are winds that blow consistently from the same direction throughout the year, moving air across large areas of earth.

- **Types of Permanent Winds:**
  - (a) Trade Winds → Northern Easterlies, Southern Easterlies
  - (b) Westerlies
  - (c) Polar Easterlies

Trade Winds:

Trade winds blow from subtropical high-pressure areas to the equatorial low-pressure belt. They are permanent winds.



Easterlies and Westerlies

• They are steady winds that blow from east to west near the Earth's equator.

Location

• They are found between approximately 30° latitude (north and south) and the equator.

• They blow from northeast in the Northern Hemisphere and southeast in the Southern Hemisphere towards the equator.

Cause

• They are created due to *Coriolis effect (rotation of the Earth)* and the unequal heating of the Earth's surface.

Westerlies

When the barometric readings suddenly decrease, it indicates that the weather will be very stormy.

• Westerlies are winds that blow from *west to east* in the mid-latitudes.

Location

• They blow between 30° and 60° latitude (in both hemispheres).

• They come from the southwest in the Northern Hemisphere and the northwest in the Southern Hemisphere.

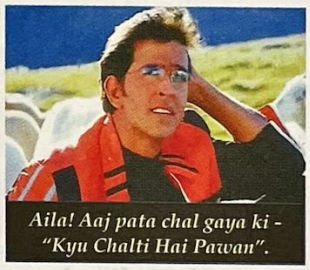
Cause

• The *Coriolis effect* causes these winds to deflect towards the east.

Roaring Forties, Furious Fifties, Shrieking Sixties

• These are names given to strong Westerly winds in Southern Hemisphere that blow over the 40°S, 50°S, and 60°S latitudes. Reason for their high speed is less landmass in Southern Hemisphere.

Coriolis Force


Aila! Aaj pata chal gaya ki - "Kyu Chalti Hai Pawan".

• Coriolis force is an apparent force that is caused due to *rotation of Earth.*

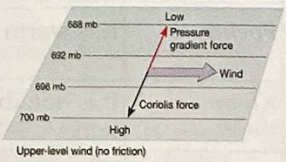
• The Coriolis force is responsible for deflecting winds towards the *right in the Northern Hemisphere* and towards the *left in the Southern Hemisphere.*

• Coriolis force is *maximum at the Poles and zero at the Equator.*

• The Coriolis force is directly *dependent on the wind speed.* The faster the wind moves, the stronger the Coriolis force becomes and greater is the wind deflection.

GEOSTROPHIC WIND

• Geostrophic wind is the wind that blows when two forces, the pressure gradient force and Earth's coriolis force, balance each other out.



Upper-level wind (no friction)

• The wind *moves parallel to isobars* (isobars are lines on a weather map that connect areas with the same air pressure) or *perpendicular to Pressure Gradient Force,* without changing direction, usually higher up in the atmosphere where there's less friction.

ITCZ, Doldrums, and Horse Latitude

- *Full form: Intertropical Convergence Zone*
- The ITCZ forms where the *northeast trade winds* from the Northern Hemisphere meet the *southeast trade winds* from the Southern Hemisphere.

> - *Wind direction is measured using: Wind vane*
> - *Wind speed is measured using: Anemometer*
> - *Humidity is measured using: Hygrometer*

- It is typically found between *the Tropic of Cancer and Tropic of Capricorn*. In the month of July it is located at 20°N-25°N.

Movement of ITCZ

- The ITCZ *moves seasonally*, following the *sun's position*.
- In the Northern Hemisphere, it moves north in the summer and south in the winter.
- The ITCZ moves more north and south over land than over water because the ocean heats up more slowly as compared to land.

Doldrums

- The Doldrums is a *low pressure area* around the Equator where the *prevailing winds are calm*.
- They are found between *10°N* and *10°S*.
- The Doldrums *overlap with the ITCZ region*.

Horse Latitude

- Horse latitudes are regions located about *30°N and 30°S of the equator.*
- It is an area of subtropical high.
- It is a high-pressure area at divergence of trade winds and westerlies.
- They are characterized by Sunny skies, calm winds, and a very little precipitation.

LOCAL WINDS

Types of Local Winds

Winds	*Warm/Cold Wind*	*Place where it Blows*
Chinook	It is warm, dry wind and is also known as Snow eaters because it melt snow cover.	Canada, eastern side of Rockies
Sirocco	It is warm, hot and dry wind. It also cruses "blood rain".	North Africa
Foehn	It is warm and dry wind.	Southern Alps mountain
Khamsin	It is hot, dry and dusty wind.	Egypt
Harmattan	They are dry, dusty warm winds. These winds are also known as "Dr. Wind".	Gulf of Guinea
Brickfielder	It is hot, dry and dusty wind.	Australia
Blizzard	They are very cold and carry snow.	Canada & Siberia
Mistral	These are strong, cold and dry winds.	France
Bora	These are strong and cold winds.	Adriatic Sea
Pampero	These are cold winds.	Pampas region, Argentina

Warm and Cold Winds

Land Breeze and Sea Breeze

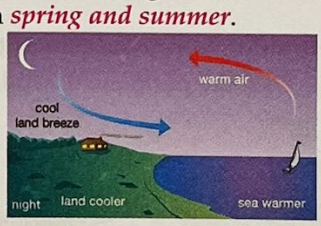
- Land Breeze and Sea Breeze are types of local winds that are due to temperature difference between land and water.

Land Breeze

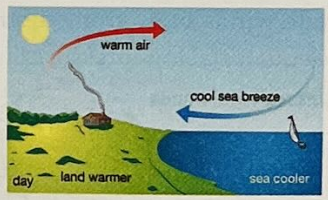
- It occurs at night when land cools faster than sea, creating high-pressure over land and low pressure over the sea, causing air to move from *land to sea*; more common in *autumn and winter* (land cools down fast because of its low specific heat).

Sea Breeze

- It occurs during the day when land heats up faster than the sea, creating low pressure over land and high-pressure over the sea, causing air to move from *sea to land*; more common in *spring and summer*.



Land Breeze



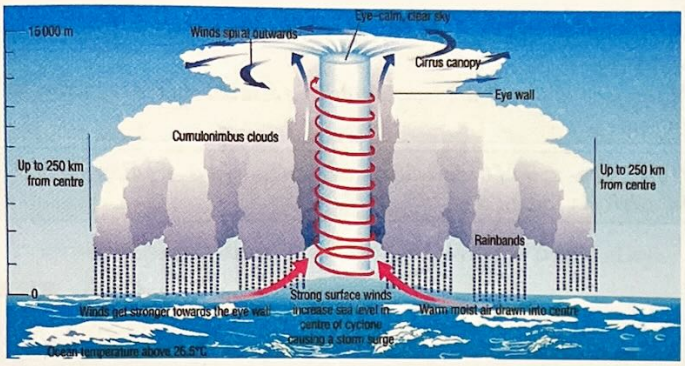
Sea Breeze

CYCLONE

- *Cyclones are rotating mass of air.*
- They are large, powerful storm that forms over warm ocean waters, with strong winds and heavy rain.

Formation of Tropical Cyclones

- Cyclones form when warm, moist air rises over the ocean. As the air rises, it creates low pressure, and cooler air rushes in to replace it. The Earth's rotation causes the air to spin, and the storm grows stronger. When the storm gets big enough, it becomes a cyclone with strong winds and heavy rain.
- A cyclone rotates *anti-clockwise* in *Northern Hemisphere* and *clockwise* in *Southern Hemisphere*.



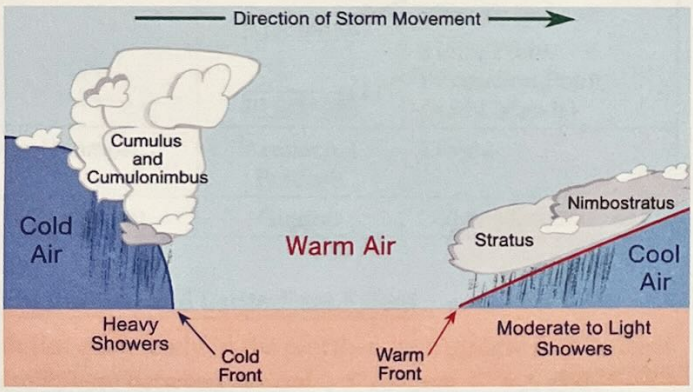
Favorable Conditions for Formation of Tropical Cyclone

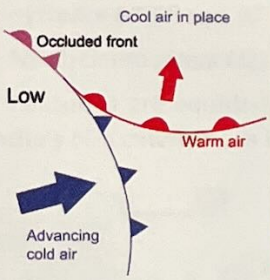
- *Large sea surface temperature* (27° C)
- *Atmospheric Instability*
- *Coriolis Force*
- *Pre-existing weak low pressure area*

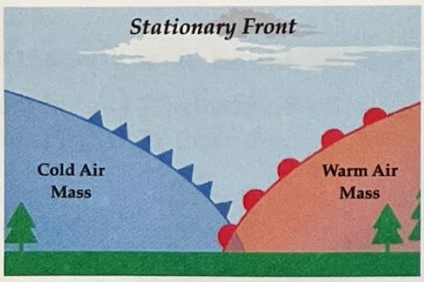
During cyclone, Cumulonimbus clouds are formed with extensive vertical development.

Formation of Temperate Cyclone:

- Mid-latitude cyclones or temperate cyclones or extra-tropical cyclones occur due to frontogenesis.
- They originate due to convergence of polar easterly cold air mass and sub-tropical westerly warm air mass in sub polar low pressure belts around 60° to 65° latitudes.
- Since the air masses are of two different properties, they can't intermingle readily. They mix with each other very slowly. As a result, a front develops between them.







Frontogenesis: It involves convergence of two distinct air masses.
Frontolysis: It involves Weakening or Destruction of a Front.

Different Names of Cyclones around the World

- *Hurricane: Atlantic Ocean*
- *Typhoon: South China Sea and Western Pacific Ocean*
- *Willy-Willy: Australia*
- *Cyclone: India*

Cyclone names are decided by regional committees, like the WMO/ESCAP Panel on Tropical Cyclones for the Bay of Bengal and Arabian Sea, that use pre-approved, sequentially assigned lists of names which are given by total 13 countries.

- **Bay of Bengal (BOB)** experiences more Cyclones than Arabian Sea because of several reasons

➢ It is surrounded by landmass which leads to more heat transfer in BOB.

➢ It is Funnel shaped, hence wind rushes in BOB from all directions.

➢ More Fresh water Influx.

➢ Monsoonal trough.

Tropical and Temperate Cyclone (Extra-Tropical Cyclone)

Tropical Cyclone	*Temperate Cyclone*
They originate over sea	They originate over sea and land
They are formed due to certain favourable condition over the sea, as mentioned above	They are formed due to frontogenesis i.e. where the warm and cold air mass meet each other
They cover less area but cause major destruction	They cover large area but cause less destruction
They occur rarely	They occur frequently
They move from east to west	They move from west to east

Cyclones form in every ocean except - South Atlantic Ocean & South Eastern Pacific Ocean.
Cyclones do not form in the Equator as there is a lack of Coriolis Force at Equator.

Anticyclone

- An anticyclone is formed around an *area of high pressure where the air sinks, causing clear skies and calm weather*. It usually brings dry, sunny conditions.
- An anticyclone rotates clockwise in Northern Hemisphere and anti-clockwise in Southern Hemisphere.

OCEAN CURRENTS

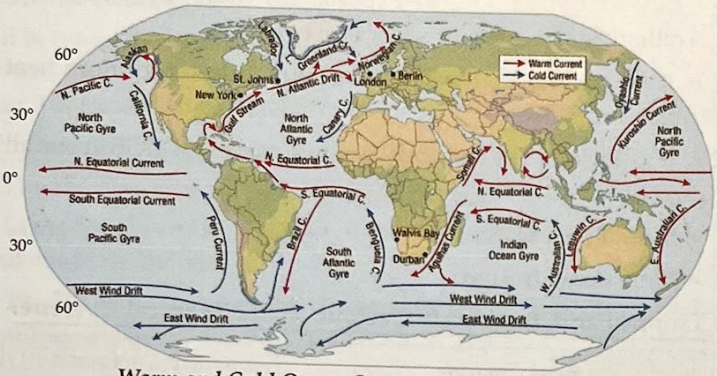
- Ocean currents are large movements of water in the ocean that flow in a specific direction.
- Ocean water moves in two directions: *horizontally and vertically*.
- *Horizontal movements* are referred to as *currents*, while *vertical changes* are called *upwellings* or *downwellings*.

Thermohaline Circulation: It is a global ocean current system driven by differences in seawater temperature and salinity, which affect its density. This process, often called the "global conveyor belt".

Reasons for Movement of Ocean Currents

1. *Wind*
2. *Density difference*
3. *Gravity*
4. *Coriolis force*
5. *Coast line*

- *Cold water moves from Poles to Equator.*
- *Warm water moves from Equator to Poles.*



Warm and Cold Ocean Currents Warm Currents

TRICK TO REMEMBER

Cold Ocean Currents → (BP GOLF World Cup California)

B	P	G	O	L
Benguela	*Peru/Humbolt*	*Greenland*	*Oyashio*	*Labrador*

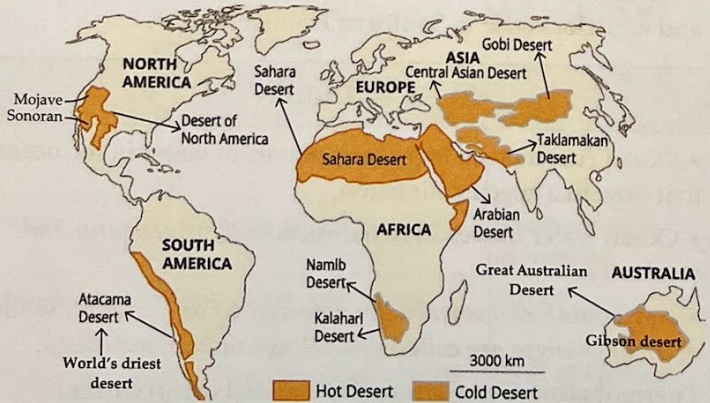
F	World	Cup	California
Falkland	*West Australian Drift*	*Canary*	*California*

Warm Ocean Currents

- Brazil, Mozambique, Agulhas, Gulf Stream, Alaska, Norwegian, Kuroshio and E. Australia.

Effects of Ocean Currents

1. ***Cold ocean currents:*** They largely contribute to the formation of ***coastal deserts in west coast regions of tropical and sub-tropical continents.*** This is because the cold water makes the air above it cooler and less able to hold moisture.
2. ***Warm ocean currents*** + ***Cold ocean currents:*** Together they create ***best fishing zones due to deposition of planktons.*** The meeting of warm and cold ocean currents also ***creates fog that is dangerous for harbouring.***



Desert around the world

Thermocline is the point below which temperature declines suddenly.
Halocline is the point below which salinity increases rapidly in sea.

Gyre: A system of ocean currents rotating in a circular pattern, by coriolis force.

INDIA

Some Facts About India

- India was a part of Gondwana land and is situated in continent of Asia.
- In terms of area: *7th* (India occupies *2.4%* of the world's area).
- In terms of population: 1st (*17.7%* of world's population lives in India).

Rank of countries around the world in terms of area

1. Russia
2. Canada
3. China
4. USA
5. Brazil
6. Australia
7. India
8. Argentina

- India has 28 States and 8 Union Territories

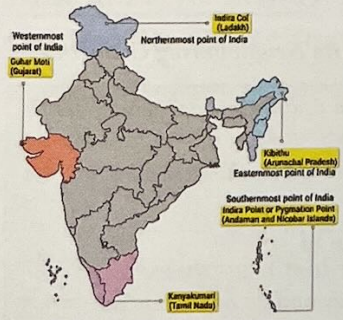
Area	*State*	*UT*
Largest	Rajasthan	Ladakh
Smallest	Goa	Lakshadweep
Population		
Largest	Uttar Pradesh	Delhi
Smallest	Sikkim	Lakshadweep

Extreme Points in India

Extremes	*State*	*Point*
Northernmost	Himachal Pradesh	Indira Col (Ladakh)
Southernmost	Tamil Nadu	Kanyakumari/Cape Comorin (Tamil Nadu)
	Mainland	
	In general	Indira Point/ Pygmalion Point (A&N islands)
Easternmost	Arunachal Pradesh	Kibithu
Westernmost	Gujarat	Guhar Moti/Sir Creek

Longitudinal and Latitudinal Extent

- It lies completely in the Northen hemisphere and Eastern hemisphere between *latitudes 8°4′N and 37°6′N* and *longitudes 68°7E* and *97°25′E*.
- North-South extent *(3214 km)* and East-West extent *(2933 km)*.
- Latitudes are equidistant but not longitudes, that's why India's N-S extension is more than E-W Extension.



Extreme Points of India;

Longitudinal and Latitudinal Extent of India

Topic of Cancer

- India is divided by Tropic of Cancer *23°30′N* in almost *two equal parts*.
- The Tropic of Cancer passes through *8 States* out of which Jaipur (Rajasthan), Agartala (Tripura), Aizawl (Mizoram) are only capitals that are above the tropic of Cancer.

TRICK TO REMEMBER → *(Gujarati Raja Made Chief Justice Win The Meeting)*

Gujarati	*Raja*	*Made*	*Chief*
Gujarat	*Rajasthan*	*Madhya Pradesh*	*Chhattisgarh*
Justice	*Win*	*The*	*Meeting*
Jharkhand	*West Bengal*	*Tripura*	*Mizoram*

Indian Standard Time

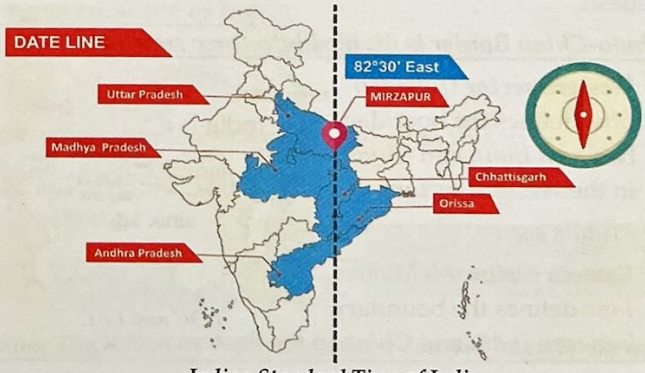
- The difference of time between *Gujarat* and *Arunachal Pradesh is 2 hours*; but both their clocks show the same timing. This is because India follows a standard time. *Indian Standard Time* (IST is 5:30 hrs ahead of GMT) is along *longitude 82.30°E*. It passes through the city of *Mirzapur in Uttar Pradesh*.
- *The IST passes through 5 States:*

TRICK TO REMEMBER → *(MOUCA)*

M	*O*	*U*	*C*
Madhya Pradesh	*Odisha*	*Uttar Pradesh*	*Chhattisgarh*

A
Andhra Pradesh

- *Time Zones: France (13), Russia (11), USA (6) → because of many territories).*
- *Tropic of Cancer meets IST at: Korea district, Chhattisgarh (Baikunthpur).*



Indian Standard Time of India

LAND BORDER OF INDIA

India's International Boundary

Countries that share boundary with India:

TRICK TO REMEMBER → *(Ba CH PaN में MBA)*

B		*Ch*	*Pa*
Bangladesh (4096.7 km)		*China (3488 km)*	*Pakistan (3323 km)*
N	*में*	*M*	*B*
Nepal (1751 km)		*Myanmar (1643 km)*	*Bhutan (699 km)*

A
Afghanistan (106 km)

Total Land Border Area: 15,106.7 km

India and Bangladesh Border Shared By

TRICK TO REMEMBER → *(MAM Take Water)*

M	A	M	Take	Water
Meghalaya	*Assam*	*Mizoram*	*Tripura*	*West Bengal*

It is surrounded by Bangladesh on three sides

• The *Radcliffe Line* is the boundary that separates India and Bangladesh.

India and Nepal Border Shared By

TRICK TO REMEMBER → *(SUBBU)*

S	U	B	B	U
Sikkim	*Uttar Pradesh*	*Bihar*	*West Bengal*	*Uttarakhand*

• *Treaty of Sugauli* was signed in *1816,* that established the boundary line between India and Nepal.

India and Bhutan Border Shared By

TRICK TO REMEMBER → *(BASA)*

B	A	S	A
West Bengal	*Assam*	*Sikkim*	*Arunachal Pradesh*

India and Pakistan Border Shared By

TRICK TO REMEMBER → *(GRP J&K Ladakh)*

G	R	P	J&K	Ladakh
Gujrat	*Rajasthan*	*Punjab*	*Jammu and Kashmir*	*Ladakh*

• The *Radcliffe Line (Sir Cyril Radcliffe drew the line)* is the boundary that separates India and Pakistan.

• *The Line of Control (LoC)* is a military control line that separates India and Pakistan in the disputed region of J&K.

India and China Border Shared By

• J& K, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh.

• ***Indo-China Border is divided into three sectors:***

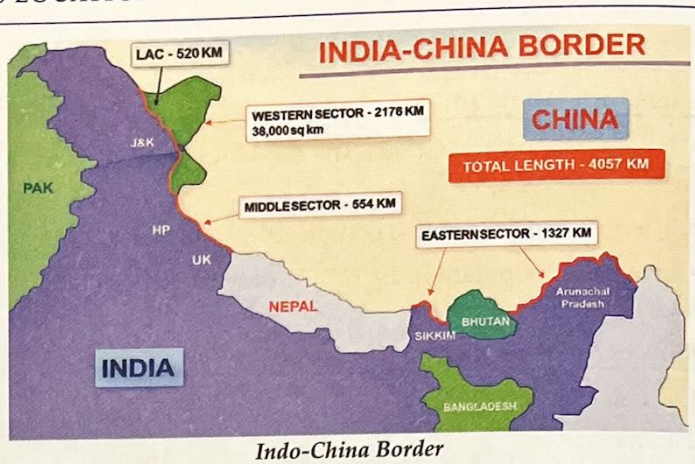
1. ***Western sector*** *(Johnson Line* defines the boundary between *India* and *China* in the Western sector).
2. ***Middle sector.***
3. ***Eastern sector*** *(McMahon Line* defines the boundary between *India* and *China* in the Eastern sector).

LOC and LAC

• India has consistently maintained that a region, also known as the Trans-Karakoram Tract, lying north of the Siachen Glacier in Ladakh, historically part of the erstwhile princely state of Jammu and Kashmir, was illegally ceded to China by Pakistan under the 1963 China–Pakistan Boundary Agreement. Which region is being referred to Shaksgam Valley.

• The Galwan River Valley, which is located in north-eastern Ladakh, east of the Aksai Chin plateau, is also illegally occupied by China.

• The *Line of Actual Control (LAC)* is a military control line that separates Indian areas of *Ladakh from Aksai Chin.*



Indo-China Border

Vibrant Villages Programme

• It is a *Centrally* sponsored Scheme announced in ***Union Budget 2022-2023 (to 2025-2026) for development of villages*** on India-China border.

India and Myanmar Border Shared By

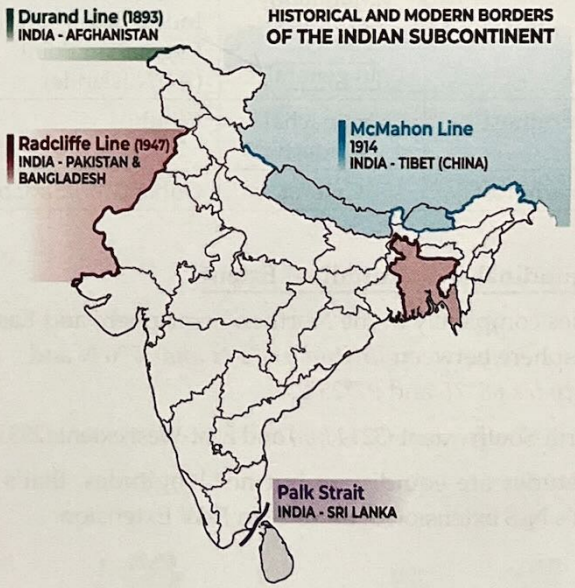
TRICK TO REMEMBER → *(AruNa MaMi)*

Aru	Na	Ma	Mi
Arunachal Pradesh	*Nagaland*	*Manipur*	*Mizoram*

India and Afghanistan

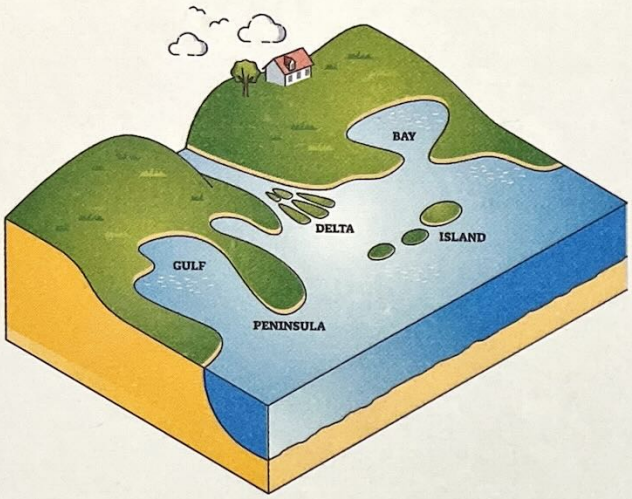
• India and Afghanistan is separated by Union Territory: *Ladakh.*

• The border between India and Afghanistan is called the *Durand Line.*



Dividing Lines of India with its Neighbouring Countries

• **Gulf:** *A gulf is a portion of the ocean that penetrates land. They are generally larger and more deeply indented than bays. Gulfs are sometimes connected to the ocean by narrow passages of water called straits.*
• *Largest Gulf in the world: Gulf of Mexico.*
• **Bay:** *A bay is a body of water that is partly surrounded by land. Bays empty out into larger bodies of water like oceans and lakes.*
• *Largest Bay in the world: Bay of Bengal.*



Some Important Facts,

- ***State sharing boundary with maximum number of states:*** Uttar Pradesh (with 8 States 1 UT (Delhi)).
- ***State sharing border with only one state:*** Sikkim (with West Bengal) and Meghalaya (with Assam).
- ***States sharing border with three countries:***

1. *Sikkim* (with Nepal, Bhutan, China).
2. *Arunachal Pradesh* (with Bhutan, China, Myanmar).
3. *West Bengal* (with Nepal, Bhutan, Bangladesh).

- ***One UT that shares boundary with three countries:*** *Ladakh* (with Pakistan, Afghanistan, and China).

Few Organisations

Organisations under Central Armed Police Force (CAPF)

- **Indo-Tibetan Border Police (1962):** ITBP (under Ministry of Home Affairs) guards the country's border with China along the Indo-Tibetan region.
- **Sashastra Seema Bal (1963):** SSB (under Ministry of Home Affairs) guards the country's borders with Nepal and Bhutan.
- **Border Security Force (1965):** BSF is known as "India's first line of Defence" and was established after Indo-Pak War. It guards country's border with Pakistan and Bangladesh..
- **Assam Rifles:** It is under Ministry of Home Affairs but the operation control is under Ministry of Defence.
- **Central Reserve Police Force (CRPF):** It is India's largest paramilitary force and is under Ministry of Home Affairs.

Indian Armed Forces (IAF)

- **Air Force/Navy/Army:** They are under *Ministry of Defence*.

Naxalite affected areas are called as "Red Corridors"

COASTAL BOUNDARY OF INDIA

- India's total coastal boundary length is approximately *11,098.81 km*.

This includes:

- ***Mainland coastline:*** *7870.51 km.*
- ***Island territories:*** *3,228.30 km.*

- India's coastline touches the Arabian Sea, Bay of Bengal, and the Indian Ocean, spanning across 9 coastal states (Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal) and 2 island groups (Andaman & Nicobar Islands and Lakshadweep Islands).

Length of Coastline of India

The State-wise/UT-wise "Length of Coastline of India' are here by mentioned below.

S.No.	State/Union Territory	Coastline length (in Km)
1.	Gujarat	2,340.62
2	Maharashtra	877.97
3.	Goa	193.95
4.	Karnataka	343.30
5.	Kerala	600.15
6.	Tamil Nadu	1,068.69
7.	Andhra Pradesh	1,053.07
8.	Odisha	574.71
9.	West Bengal	721.02
10.	Daman & Din	54.38
11	Pondicherry	42.65
12.	Lakshadweep Islands	144.80
13.	Andaman & Nicobar Islands	3,083.50
	Total Length of Coastline of India	**11,098.81**

Longest coastline of India:

- ***UT:*** *Andaman & Nicobar Islands → 3,083.50 km*
- ***State:*** *Gujarat → 2,340.62 km*
- ***Shortest coastline of India:*** *Goa → 193.95 km*

States with longest coastline

1. *G: Gujarat*
2. *T: Tamil Nadu*
3. *A: Andhra Pradesh*

TRICK
GTA

Largest coastal boundary of the world: Canada

Union Territories of India that share coastal boundaries are:

1. ***Andaman and Nicobar Islands (Bay of Bengal) → located on eastern coast of India.***
2. ***Lakshadweep (Arabian Sea).***
3. ***Puducherry (Bay of Bengal).***
4. ***Daman and Diu (Arabian Sea).***

Sea Borders of India

- India shares its sea borders with two countries: *Sri Lanka and Maldives*.
- India and Sri Lanka is separated by *Palk Strait* (a narrow water body, which connects two large water bodies or separates two landmasses).

• India's sea borders include the *Bay of Bengal to the east, the Arabian Sea to the west, and the Indian Ocean to the south.*

• *Gulf of Mannar* is a shallow sea between *India and Sri Lanka,* located near the southern tip of India.

United Nations Convention on the Law of the Sea (UNCLOS)

• It was *adopted on 1982* but came into *force on 1994.*

• It is an international treaty that establishes rules and guidelines for the use and protection of the world's oceans.

• *It covers 5 zones: Internal Waters, Territorial Sea, Contiguous Zone, Exclusive Economic Zone (EEZ)* and *High Seas.*

Territorial Limit of India

• The length of coastline is measured in *Nautical Miles (nm).*

1 nautical miles 1.852 km.

• *India's territorial limit extend upto 12 nm (12 nm = 22 km) from the coast.*

• **Contiguous Zone:** A contiguous zone is a maritime area that lies beyond a country's territorial sea. It extends upto *24 nm.*

• **Exclusive Economic Zone:** It is a maritime area that extends upto 200 mm from a coastal nation's territorial sea.

Kanyakumari is a place in India where the Bay of Bengal, the Indian Ocean, and the Arabian Sea meet.

New Pamban Bridge, the first Vertical lift sea Bridge of India which has been inaugurated recently connects Pamban (Rameswaram island) to Mandapam (Mainland India).

****PLEASE NOTE THAT**

• Recently Government of India on 29th April 2025 released that the length of India's coastline has been recalculated and is now 11098.81 kms.

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Physiographic Divisions of India

• India is divided into six physiographic divisions based on the varied physical features.

1. *Himalayas/Northern Mountains*
2. *Northern Plains*
3. *Peninsular Plateau*
4. *Indian Desert*
5. *Coastal Plains*
6. *Islands*

MOUNTAINS

• Mountains are landforms that are much higher than the surrounding land. They are usually steeper than hills and often have a sharp peak, or summit.

Types of Mountains

1. **Fold Mountains:** They are formed when tectonic plates collide, causing the Earth's crust to buckle and fold. These mountains are often characterized by parallel ridges and valleys.

   Types

   1. *Young Fold Mountains:* Mountains that were formed by tectonic activity a few million years ago.

      Eg. *Himalayas, Andes (located in South America and is world's longest mountain range), Alps (Europe), Rockies (North America), Atlas (Africa), Caucasus mountains.*

   2. *Old Fold Mountains:* Mountains that were formed by the folding of the Earth's crust in the distant past.

      Eg. *Aravalli (residual mountains) Ural (separates Asia and Europe) Appalachians (North America).*

2. **Block Mountains:** Block mountains are formed when large areas of the Earth's crust are broken and displaced due to vertical slippage.

Horst → raised block of land bounded by faults, often appearing as a ridge or plateau and *Graben (also known as Rift Valley) lowered block of land between two faults*, often forming a valley are formed in block mountains.

Eg. *Vindhya and Satpura, Vosges Mt. (France), Harz Mt. (Germany), Great African Rift Valley (world's longest Rift Valley).*

3. **Volcanic Mountains:** They are formed when magma from the Earth's mantle rises to the surface and erupts, creating lava flows that build up over time.

Eg. *Mt. Stromboli (known as "Lighthouse of Mediterranean", Mt. Cotopaxi (Ecuador), Fujiyama (Japan), Barren and Narcondam (Andaman & Nicobar Islands), Ojas del Salado (world's highest active volcano in Chile-Argentina border), Mt. Kilimanjaro (Africa).*

HIMALAYAS

• The Himalayas are one of the *youngest fold mountain* ranges in the world of tectonic origin and comprise mainly sedimentary rocks.

Geosyncline: It is an *obsolete geological concept* that described a long, linear trough in the Earth's crust where vast amounts of sediment accumulate, which was believed to later be deformed into mountain range.

Formation of Himalayas

• They were formed when the *Indo-Australian tectonic plate* and *Eurasian (Asian) tectonic plate collided*, this caused the closure of the ancient *Tethys Sea*, leading to the folding and uplifting of sediments deposited on its seabed. This resulted in creation of multiple massive mountain ranges which are collectively known as the Himalayas.

Four Mountain Ranges in Himalayas

1. Trans-Himalayas

• It is located north of the Great Himalayas, this region is characterized by high plateaus and arid landscapes.

• *Average elevation: 3000 m.*

• Kailash range (China) is also part of Trans Himalaya.

The prominent ranges under Trans Himalayas from North to South order

1. *Karakoram Range*
   • It forms India's boundary with *Afghanistan and China.*
   • Highest peak of this range is *K2*, also known as *Mt. Godwin-Austen (8611 m)*, which is also *world's second highest peak*.
   • Mt. Rakaposhi, Mt. Gasherbrum is also a part of Karakoram Range.
2. *Ladakh Range*
   • It has the *highest slope*.
   • *Shyok* (tributary of Indus) river flows between *Karakoram* and *Ladakh* range.
3. *Zanskar Range*
   • *Kamet peak* is the *highest peak* of this range.
   • Indus river flows between *Ladakh* and *Zanskar* range.

Glacier of Karakoram Range

1. *Siachen*
   • *2nd longest non-polar glacier.*
   • *Highest battlefield (5700 m above)*
   • *Operation Meghdoot (1984)*
2. *Baltoro (Gilgit-Baltistan)*
3. *Hispar*
4. *Biafo*

**Longest non-polar glacier in the world: Fedchenko Glacier in Tajikistan*

**Longest glacier in the world: The Lambert Glacier in Antarctica*

2. Greater Himalayas

• They are also known as *Himadri/Inner Himalayas.*

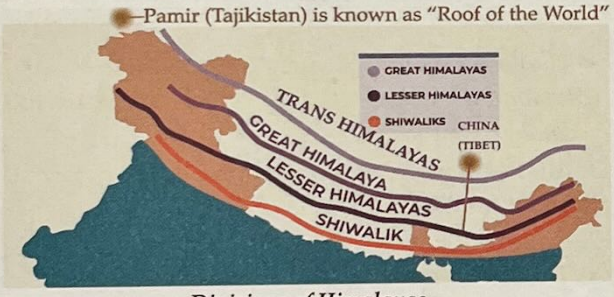
• They are asymmetrical in nature.

• The core of Greater Himalayas is composed of *granitic rock*.

- *Average height: 6000 m.*
- *Width: 120-190 km.*
- *Axial range: 2500 km.*
- *It's westernmost point is: Nanga Parbat (8126 m)*
- *It's easternmost point is: Namcha Barwa (shows syntaxial bending).*
- *Gaurishankar* (Peak in Greater Himalayas, Nepal).
- Kedarnath, Badrinath, Bandarpunch, these important peaks located in Uttarakhand, are also part of the Greater Himalayas.

Highest Peaks of Greater Himalayas

1. *Mt. Everest* (Highest mountain in the world with *8848 m* height) → *Local names: Sagarmatha (in Nepal)* and *Chomolungma (in Tibet).*
2. *Mt. Kanchenjunga* (highest in India *(Sikkim)* with *8598 m* height).
3. *Mt. Lhotse* (in *Tibet* and *Khambu* region of *Nepal* with *8516 m* height).
4. *Mt. Makalu (8485 m).*
5. *Dhaulagiri (8167 m)* → Also known as *White Mountain.* } Nepal
6. *Annapurna (8091 m).*
7. *Nanda Devi* (highest peak in *Uttarakhand* with *7816 m* height).
8. *Mt. Kamet (7756 m* in *Uttarakhand).*



Divisions of Himalayas

3. Lesser Himalayas

- They are also known as *Middle Himalayas/Himachal.*
- Average height: *4000 m.*
- Width: *60-80 km.*

Its Different Names:

- *J&K: Pir Panjal Range*
- *Himachal Pradesh: Dhauladhar,*
- *Uttarakhand: Nagtibba.*
- *Nepal: Mahabharat Range.*

Valley

- *A valley is a low area of land between hills or mountains, typically with a river or stream flowing through it.*
- *Kashmir Valley is between Great Himalayas and Lesser Himalayas.*
- *Kangra Valley is a type of longitudinal valley that runs parallel to Mountain Trend, where as Kullu Valley is a type of Transverse Valley that cuts across mountain trend.*

4. Shiwaliks/Outer Himalayas

- They are also known as *Outer Himalayas.*
- *Average height: 1000 m.*
- *Width: 10 to 50 km.*
- In the eastern part they disappear and *Duars* (they are soft unconsolidated deposits that are good for tea cultivation) take its place.
- Longitudinal valleys called *Duns* are formed between *Lesser Himalayas and Shiwaliks. Largest Dun* in India is Dehradun.

The portion of the Shiwalik lying in the region of Nepal is called the *Churia Range.*

- *Mount Kunlun, known as "the Ancestor of Mountains," is not part of the Himalayas but formed because of the collision of the Indo-Australian plate and Eurasian plate.*
- *The Pamir Mountains or Pamir Knot, also known as the "Roof of the World" are formed by the junction or "knot" of the Tian Shan, Karakoram, Kunlun, and Hindu Kush ranges.*
- *The Tibetan Plateau is also known as "Roof of the World".*

REGIONAL DIVISION OF HIMALAYAS

- *Punjab Himalayas* between *Indus* and *Sutlej* river.
- *Kumaon Himalayas* between *Sutlej* and *Kali* river.
- *Nepal Himalayas* between *Kali* and *Teesta* river.
- *Assam Himalayas* between *Teesta* and *Dihang* river.

Kashmir Valley

- The Kashmir Valley is also known for the *Karewa formations* (composed of *glacial* and *lacustrine* deposits), which are used to grow *Zafran, a local variety of saffron.*
- Zoji La on the Greater Himalayas, Banihal on the Pir Panjal, Photu La (Ladakh) on the Zanskar, and Khardung La on the Zanskar are some of the region's most important passes.
- This region also has some of the most important *freshwater lakes*, such as *Dal* and *Wular*, as well as *saltwater lakes*, such as *Pangong Tso* and *Tso Moriri (Locate it on Map).*
- The Indus River and its tributaries, such as the Jhelum and Chenab, drain in this region.

Himachal and Uttarakhand Himalayas

- *They are spread across three states: J&K, Himachal Pradesh, and Uttarakhand.*
- It is drained by two of India's largest river systems, the Indus and the Ganga.
- The *Bhotia tribe* live largely in the valleys of the Greater Himalayan range. These are nomadic people who travel to the *'Bugyals' (summer grasslands in the mountains)* in the summer.

Orientation of Himalayas

- *In J&K: North-West to South-East.*
- *Sikkim: East-West.*
- *Arunachal : South-West to the North-East.*
- *Eastern Himalayas : North-South.*

Darjeeling and Sikkim Himalayas

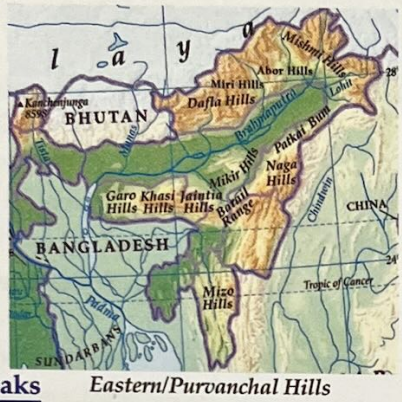
- It is home to India's highest peak *Mt. Kanchenjunga.*
- The *Lepcha/Bhutia tribe* live in the higher elevations of this region.
- *Duar formation* can also be seen here.

Arunachal Himalayas

- The eastern border of *Eastern Himalayas* is formed by *Arunachal Himalayas*.
- ***Important peaks include:*** *Kangtu and Namcha Barwa.*
- ***Important river include:*** *Kameng, Subansiri, Dibang.*
- The *Monpa, Dafla, Miri, Abor, Mishmi, Nyishi,* and *Nagas* are some of the most well-known hills from west to east.
- *Jhumming* is practiced by the majority of these groups.
- *Mt. Kangto* is the highest peak of Arunachal Pradesh.

Eastern/Purvanchal Hills

- Eastern Hills/ Purvanchal Hills are part of the Himalayan mountain chain, with a basic alignment from north to south.
- They extend from *Arunachal Pradesh in the north to Mizoram in the south.*



Eastern/Purvanchal Hills

Some Important Hills/Peaks

- Patkai Hills
- Naga Hills (highest peak - *Saramati peak*), Nagaland.
- Manipur Hills (highest peak - *Mount Iso or Esii or Tempo*), Manipur.
- Mizo/Lushai Hills (highest peak - *Mt. Phawngpui* - also known as Blue mountain), Mizoram.
- *Mt. Jhopuno:* Sikkim.
- *Gorichen Peak:* Arunachal Pradesh.
- *Thaidawr Tlang:* Tripura.
- In Manipur and Mizoram (*also known as Molasses Basin*), the *Barak* is a significant river.
- The state of Manipur is known for *world's only floating lake Loktak Lake. Keibul Lamjao National Park* is located here *(only floating National Park in the world).*

Note

- *The Barail range, located in the North-east, stretching from Nagaland & Manipur to the east and Assam & Meghalaya to the west, acts as a watershed between the Brahmaputra and Barak rivers.*
- *Garo, Khasi, Jaintia, North chachar hills are not part of Himalayas but are part of Peninsular Plateau.*

MOUNTAIN PASSES

- A mountain pass is a route that runs through or over a mountain range.
- Mountain passes between mountain peaks may form during the formation of the mountain range, or they may form as a result of the action of glaciers, running water, or precipitation in the form of rain or snow.

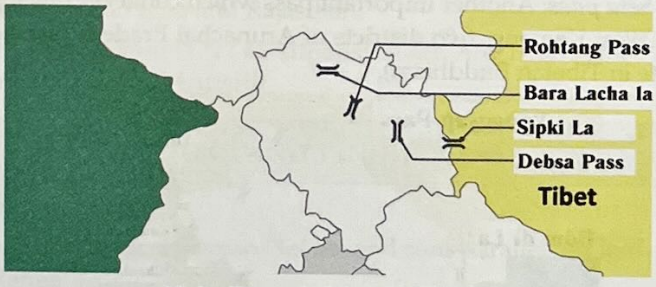
J&K and Leh-Ladakh

- ***Karakoram Pass:*** It is the *highest pass* that connects *India and China.*
- ***Pir Panjal Pass and Banihal Pass:*** They connect *Jammu to Srinagar.*
- ***Burzil Pass:*** It is between *Srinagar* and *Gilgit.*
- ***Zoji La:*** It connects *Srinagar in Kashmir* to *Leh-Ladakh.*
- ***Mig La Pass:*** World's *highest motorable road* (constructed through *Project Himank*) in *Ladakh.*
- ***Khardung La*** - connects Leh to Nubra valley.
- ***Pensi La*** - connects Leh back to Kashmir.
- Some other important passes are: **Mintaka, Aghil, Khunjerab, Lanak, Chang La, Imis La** - these are located at the border.

Major Passes in J&K and Leh-Ladakh

Himachal Pradesh

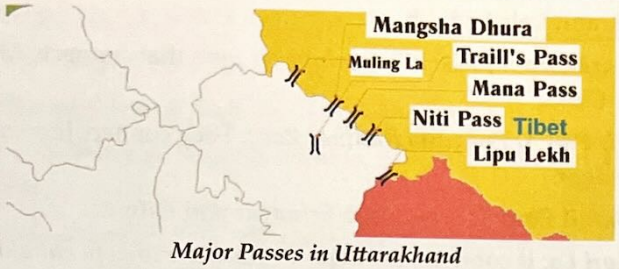
- ***Shipki La Pass:*** It connects *Kinnaur district* of *Himachal Pradesh* to Tibet, China. *Sutlej* enters in India through this pass.
- ***Rohtang Pass:*** It connects the *Kullu Valley* to the *Lahaul* and *Spiti valleys* in Himachal Pradesh *(Atal Tunnel, the longest highway tunnel (9.02 km) is built under the Rohtang Pass).*
- ***Bara-Lacha La Pass:*** It connects *Lahaul* and *Leh* by crossing the Zanskar range.



Major Passes in Himachal Pradesh

Uttarakhand

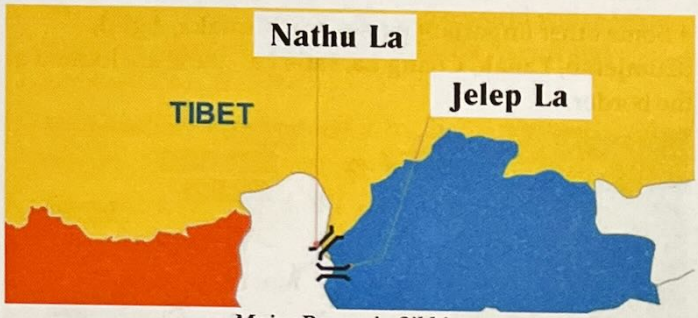
- ***Mana Pass:*** It connects the *Mana* with *Tibet.*
- ***Niti Pass:*** It connects *Uttarakhand* and *Tibet.*
- ***Lipu Lekh Pass:*** It is between *Uttarakhand, Tibet and Nepal,* it acts as a tri-junction.
- ***Mauling La Pass:*** During the winter, this seasonal pass connecting *Uttarakhand and Tibet.*



Major Passes in Uttarakhand

Sikkim

- ***Nathu La Pass:*** It links ***Sikkim*** and ***Tibet***.
- ***Jelep La Pass:*** It is located on the border of ***Sikkim*** and ***Tibet***.



Major Passes in Sikkim

Arunachal Pradesh

- ***Bom Di La Pass:*** It connects ***Arunachal Pradesh with Lhase (Tibet)***.
- ***Dihang La Pass:*** This pass connects the states of ***Arunachal Pradesh and Myanmar***.
- ***Pangsau Pass:*** It connects ***Arunachal*** and ***Myanmar***.
- ***Bum La Pass:*** It is a border pass between ***China*** and ***Tawang*** district of ***Arunachal Pradesh***.
- ***Diphu Pass:*** It is in ***Arunachal Pradesh*** that borders ***Myanmar*** and is close to the trijunction of ***India, Myanmar, and China***.
- ***Yangyap Pass:*** It is a pass from where ***Brahmaputra river enters India***.
- ***Sela pass:*** Another important pass which connects Tawang & West Kameng, two districts of Arunachal Pradesh (sacred site in Tibetan Buddhism).

Major Passes in Arunachal Pradesh

PENINSULAR PLATEAU

Peninsula

- A peninsula is a landform that is *surrounded by water on three sides*, but connected to a *large landmass on one side*.

Plateau

- A plateau is a *flat or gently sloping elevated landform* that rises above the surrounding area. It is often referred to as *tableland* due to its flat top. Plateaus can be formed due to volcanic activity, tectonic, movements, or erosion.
- *General elevation:* West to East.

> *Highest plateau in the world: Tibetan Plateau (4500 m) also known as "Roof of the World".*

- Peninsular Plateau is the *largest physiographic division of India,* covering a vast area in the southern part of the country.
- The Peninsular Plateau is one of the *world's oldest landforms*.
- *General elevation of Peninsular Plateau: 600-900 m* above sea level.
- The Peninsular plateau is a tableland made up of old crystalline, igneous and metamorphic rocks.
- It was developed as a result of the breakup and drifting of the *Gondwana Land* (it was earlier a part of *African continent*).
- The plateau has large and shallow valleys as well as rounded hills.
- *This plateau is divided into two sections:* the *Central Highlands* and the *Deccan Plateau*.

CENTRAL HIGHLANDS

- The Central Highlands are located to the north of the Narmada, covering major area of Malwa Plateau.
- It is bordered by *Aravalli Range in the northwest* and the *Vindhya Range in the south*.
- *General elevation*: *700-1000 m*.
- Central Highlands are *wider in west but narrower in the east*.
- The Chotanagpur plateau marks the further eastward extension, drained by the *Damodar river*.

Marwar/Mewar Plateau

- It is located in eastern *Rajasthan*.

Malwa Plateau

- The plateau is an extension of the Deccan Traps and is spread across *Rajasthan* and *Madhya Pradesh*.
- It is composed of extensive lava flow and is covered with *black soil*.
- Rivers like *Mahi, Chambal, Betwa, Sindh, Ken* flow southwest to northeast of this region.

Bundelkhand

- It is spread across the states of *Uttar Pradesh* (Districts: Chitrakoot, Jhansi, Jalaun, Hamirpur) and *Madhya Pradesh*.
- *General elevation: 300-600 m.*

Baghelkhand

- It is spread across the states of *Uttar Pradesh, Madhya Pradesh* (Districts: Rewa, Satna, Shahdol, and Sidhi).

Peninsular Plateaus

Chotanagpur Plateau

> *• Rashtrapati Bhavan is located on Raisina Hill (400-600 m) in New Delhi, India.*
> *• Dilwara Jain Temple is located on Mt. Abu Hills in Rajasthan.*

- It is spread across *Jharkhand, Chhattisgarh, Odisha, West Bengal*.
- It is often referred to as the *"Ruhr of India"* due to its rich mineral deposits, similar to Ruhr region in Germany.
- Netarhat in Jharkhand is known as *"Queen of Chotanagpur"* because of its scenic beauty, pleasant climate, and dense forests.
- *It comprises of three major plateaus: Ranchi Plateau, Hazaribagh Plateau, and Koderma Plateau*
- The highest peak of the Chotanagpur Plateau is *Parasnath Hill*, located in *Jharkhand (on the name of 23rd Tirthankar)*, which rises to an elevation of *1,365 m*.
- The Damodar River flows through the center of the plateau, creating a rift valley that runs from west to east.

Aravallis

> *Jadugoda mines of Jharkhand is famous for Uranium mines*

- The Aravallis Range is a group of *old fold mountains* that run from southwest to northeast.
- *General elevation: 800 m.*
- The Aravalli Range stretches from *Delhi to Gujarat*, passing through Haryana and Rajasthan.
- *Guru Shikhar (1722 m)* situated in *Mt. Abu Hills* is the *highest peak of Aravalli*.

SATPURA AND VINDHYA RANGE

Satpura Range

- It lies north of Deccan Plateau and runs parallel to Vindhya Range.
- It is a block mountain that extends through the states of *Madhya Pradesh, Maharashtra, Chhattisgarh, and Gujarat*.
- **It comprises of three hills**

1. *Mahadeo Hills to the north* → highest point of Satpura range *"Dhupgarh" (1350 m) in Madhya Pradesh* is located here.
2. *Maikal Range to the east* → highest peak of Maikal range is *Amarkantak Plateau (in Madhya Pradesh)* from where river *Narmada and Son originates*.

Amarkantak (has abundant deposits of Bauxite) is the meeting point of Satpura and Vindhya range.

3. ***Asirgarh Hills***

- Located to the west/southwest of the Maikal hills & east of Rajpipla hills (The Asirgarh fort, also known as the "Key of Deccan" is located here).

4. ***Rajpipla Hills*** to the west.

- ***Hill station:*** *Pachmarhi (also known as "Queen of Satpura").*

Vindhya Range

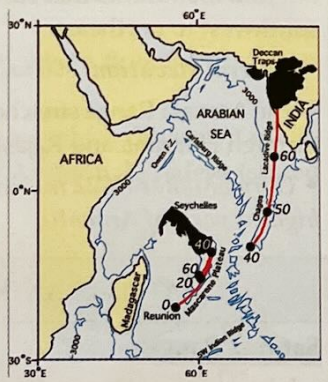
- The Vindhya range (also a block mountain) mostly extends through the Indian states of *Gujarat, Rajasthan, and Madhya Pradesh*.
- The highest point of the Vindhya Range is known as *Sadbhawna Shikhar/Kalumar Peak/Goodwill Peak is 752 metres (2467 feet)*.
- *Panna* in *Madhya Pradesh* is located in Vindhya Range and is famous for its *diamond mines*.
- The Kalinjar Fort (declared as National Geo-Heritage Site by GSI), is located in the Banda district, Uttar Pradesh, in the Bundelkhand region, on an isolated hill within the Vindhya Range.

DECCAN PLATEAU

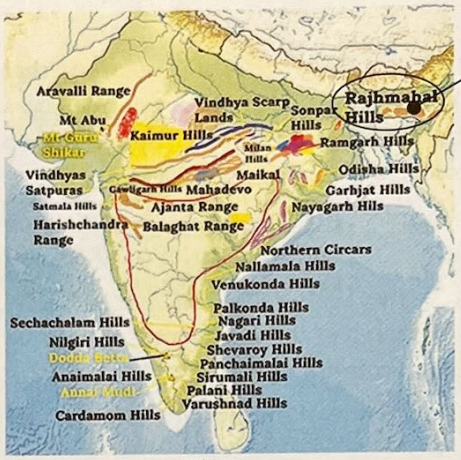
- The Deccan Plateau is a *triangular landmass* to the south of the Narmada river and covers the southern states of *Kerala, Tamil Nadu, Andhra Pradesh, Telangana, Karnataka,* and *Maharashtra*. The Deccan Plateau is bordered by the *Western Ghats to the west* and the *Eastern Ghats to the east*. The Satpura Range forms its northern boundary.

Formation of Deccan plateau:

India was once part of the Gondwana land. After the separation from Gondwana, the Indian Plate started moving northwards toward the Eurasian Plate. While passing over the Hotspot volcanic region near Reunion Islands (close to Mauritius), massive volcanic eruptions occurred. These eruptions released huge amounts of basaltic lava, which spread over western India for ages and formed the Deccan Traps, that's why black soil is found there.



- The *Mahadev, Kaimur, and Maikal* ranges form its eastern extensions.
- It is higher in the west and slopes gently eastward (the rivers in this region flow towards east).
- An extension of the Plateau is also visible in the northeast, locally known as the *Meghalaya Plateau, Karbi-Anglong Plateau* and *North Cachar Hills*.



Plateaus

> *• The Malda fault or Malda gap separates the Chotanagpur plateau from Meghalaya Plateau, Karbi Anglong Plateau (North Cachar Plateau).*

> *• The Garo, Khasi and Jaintia Hills of the Meghalaya Plateau and the Mikir Hills & North Cachar Hills of the Karbi Anglong Plateau are considered an eastward extension of the Rajmahal Hills/Chotanagpur Plateau.*

WESTERN AND EASTERN GHATS

- The Western Ghats and the Eastern Ghats mark the western and the eastern edges of the Deccan Plateau respectively.
- Western Ghats are *block mountains*.
- The Western and Eastern Ghats *meet at Nilgiri Hills* in *Tamil Nadu*.

Western Ghats	*Eastern Ghats*
They are continuous and can be crossed through passes only	They are discontinuous, irregular and dissected by rivers
Average height: 1200 m (higher than Eastern Ghats)	Average height: 600 m (lower and narrower than Western Ghats)
They stretch from Tapi to south of Nilgiri Hills	They stretch from Mahanadi Valley to the Nilgiri Hills in the south
They spread across Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu, Goa	They spread across Odisha, Telangana, Andhra Pradesh, Karnataka, Tamil Nadu
Highest peaks: *Anamudi (2695 m on Annamalai Hills)* in *Kerala*	Highest peak: *Jindhagada (1690 m)* and *Mahendragiri (1501 m → in Odisha)*

- In Maharashtra, western ghats are known as *Sahyadri Hills* and their height increases from North to South.

Passes in Western Ghats

- ***Thal Ghat:*** It connects Mumbai to Nasik.
- ***Bhor Ghat:*** It connects Mumbai to Pune.
- ***Pal Ghat (Palakkad Gap):*** It connects *(Nilgiri to Annamalai)* and *Coimbatore (Tamil Nadu)* to *Palakkad (Kerala)*.

Some important hills & ranges of Western Ghats in different states:

- ***Gujarat:*** Barda hills, Girnar hills, Mandav hills, Garda hills etc.
- ***Maharashtra:*** Ajanta, Satmala, Balaghat, Harish Chandra, Gavilgarh range, Mahabaleshwar, Kalsubai peak etc.
- ***Karnataka:*** Badami hills, Bagalkot hills, Chitradurga hills, Shimoga hills, Baba Budan hills.
- ***Tamilnadu:*** Nilgiri hills, Palani hills, Varusanadu hills.
- ***Kerala:*** Nilgiri hills, Annamalai hills (Anamudi peak - highest peak of Western Ghats), Cardamom hills, Palakkad hills (also known as Palakkad gap).

Importance of Nilgiri Hills :

- *Nilgiri* is located at the tri-junction of three states: Kerala, Tamil Nadu and Karnataka.
- Highest peak of Nilgiri - *Dodabetta (2637 m)* - second highest peak of South India & Western Ghats.
- *Ooti*, a famous hill station of Tamilnadu located here.
- *Nilgiri* is the meeting point of the Eastern Ghats and Western Ghats.

Some important hills & ranges of Eastern Ghats in different states:

- ***Tamilnadu:*** Pachaimalai hills, Javadi hills.
- ***Andhra Pradesh:*** Nallamala hills, Velikonda range, Palkonda range, Seshachalam hills (The Tirupati temple located here).
- ***Odisha:*** Bamra hills, Kanaka hills, Khondamal hills. (Garhjat hills in Odisha are part of central highlands, also located at the starting point of the Eastern Ghats).

• Bhima Fault, located in peninsular plateau (mainly in Karnataka and Maharashtra) - is known for recurrent seismic activity.

Some Famous Hills

- *Dhinodhar Hills:* ***Gujarat.***
- *Kalsubai Peak:* ***Maharashtra.***
- *Mt. Saramati:* ***Nagaland.***
- *Shatrunjaya Hills:* ***Gujarat.***
- *Anantagiri Hills:* ***Andhra Pradesh (Borra Caves are situated in these hills).***

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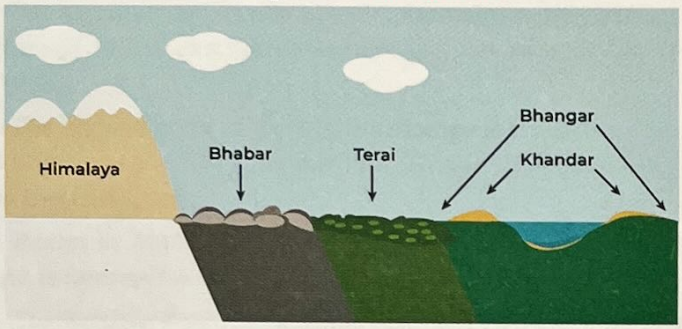
NORTHERN PLAINS

Formation of Northern Plains

- The Northern Plains are *flat, fertile lands* formed by the deposition of alluvial soil from the Himalayan River system namely *Indus, Ganga, and Brahmaputra*.
- The deposited material forms a vast and fertile stretch of land, ideal for farming.
- **Length:** *3200 (2400 Km in India)*.
- **Average Width:** *150-300 Km*.
- **Depth of Alluvial Deposits:** *1000-2000 m*.



Physiographic Divisions of Northern Plains

Classification of Northern Plains

1. Bhabar

- It is a *narrow belt (8-16 km wide)* lying south of the *Shiwaliks*.
- River coming down from the mountains deposit stones and pebbles, due to which it disappears.
- This region is *not suitable for agriculture* due to *excessive porosity*.

2. Terai

- It lies south of the Bhabar region *(width: 10-20 km)*.
- *Streams reappear* as they seep through the Bhabar layer, forming a *marshy area*.
- Terai region is rich in lush green vegetation and fertile soil, making it *suitable for agriculture*.
- ***Important National Parks in the Terai Region:*** *Jim Corbett National Park* (Uttarakhand), *Dudhwa National Park* (Uttar Pradesh), *Valmiki National Park* (Bihar), *Rajaji National Park* (Uttarakhand), *Chitwan National Park* (Nepal).

3. Alluvial Flood Plains

The fertile lands formed by the deposition of river sediments.
They are divided into:

Khadar (New Alluvial Soil)

- It is newly deposited *floodplain*, renewed annually by river floods.
- Khadar is *more fertile than Bhangar*, suitable for *intensive farming*.

Bhangar (Old Alluvial Soil)

- It is *older, elevated floodplain* with deposits over thousands of years.
- The region has *more calcareous (kankar-rich)* deposits, making it less fertile.

COASTAL PLAINS OF INDIA

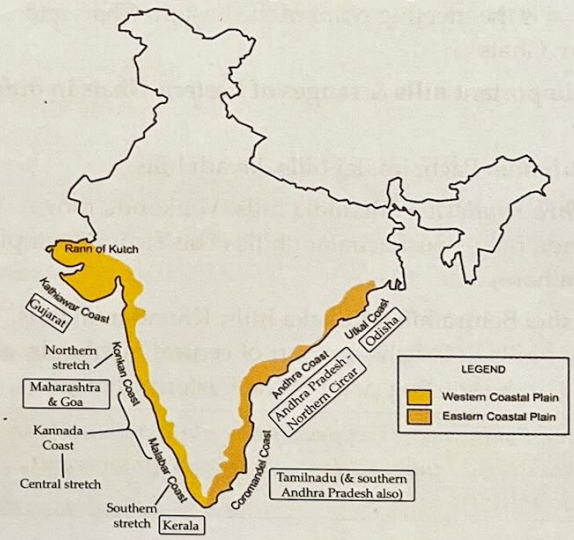
- India has two major coastal plains along the Arabian Sea and the Bay of Bengal. The coastal regions play a key role in trade, tourism, and port development.

Western Coastal Plains

- They are narrow in the middle, wider at the ends *(Dumbbell-like shape)*.
- The Western Coastal Plains of India are called *submerged coastal plains* because a part of the land near the coast has sunk below sea level over time.
- Rivers do not form deltas because they flow quickly into the sea.
- They are famous for formation of *backwaters (Kayals)*.
  Eg. ***Punnamada Kayal in Kerala*** *(famous for the Nehru Trophy Boat Race)*.

Eastern Coastal Plains

- The Eastern Coastal Plains lie along the *Bay of Bengal* and stretch from *West Bengal to Tamil Nadu*.
- They are wider than the Western Coastal Plains and have *emerging coastline with large river deltas*.
- They are formed by rivers like *Ganga, Mahanadi, Godavari, Krishna, and Kaveri* that bring soil and deposit it along the sediments.
- It is not much suitable for port development.



Western and Eastern Coastal Plains

PORTS

Classification of Indian Ports

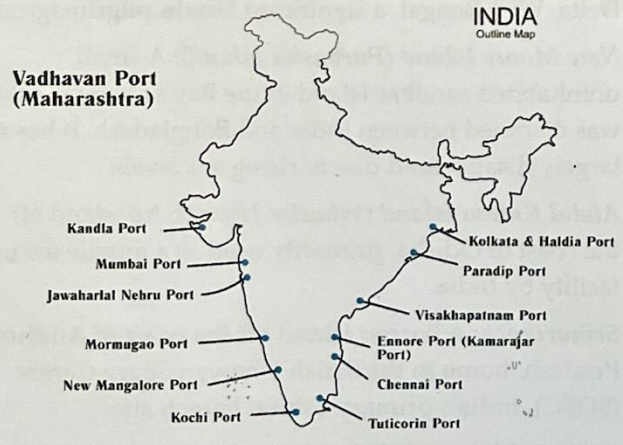
Major Ports

- ***Total major ports:*** *13*
- ***Public Ports:*** *12* ***(ownership and management by Central Government)***
- ***Privately managed port:*** *1* → *Kamarajar port* (located in Ennore in Tamil Nadu) is the *only corporate-owned port by GOI*.

"Vizhinjam International Seaport (in Kerala) is the first transhipment port in India.

13 Major Ports of India

Port Name	Location	Special Features
Kandla Port **(Deendayal Port)**	Gujarat	Tidal port
Mumbai Port	Maharashtra	Largest natural harbour
Jawaharlal Nehru Port **(Nhava Sheva Port)**	Maharashtra	Largest container port in India/ Satellite port
Mormugao Port	Goa	On the estuary of Zuari river
Mangalore (New Mangalore port)	Karnataka	
Cochin Port	Kerala	It is also known as *"Queen of Arabian Sea"*
Ennore Port **(Kamarajar Port)**	Tamil Nadu	India's first corporate port
Chennai	Tamil Nadu	
Tuticorin Port **(V.O. Chidambaranar Port)**	Tamil Nadu	India's southernmost port
Vishakhapatnam Port	Andhra Pradesh	Deepest landlocked port in India
Paradip Port	Odisha	
Kolkata Port **(Shyama Prasad Mukherjee Port)**	West Bengal	India's only riverine port (also the oldest port developed by British)
Haldia Port	West Bengal	It is also known as *"Diamond Harbour"*



Major ports in India

Great Indian Desert (Thar Desert)

- The Thar Desert lies to the northwest of the *Aravalli Range*.
- It experiences *low rainfall* (about 150 mm per year).
- Summers are extremely hot, while winters are cold and dry.
- It is also known as *"Marusthali"* meaning *"Land of Dead"*.
- Most rivers here are ephemeral, meaning they only flow during the rainy season.
- It is believed that during the Mesozoic era the area was submerged under the water.

ISLANDS

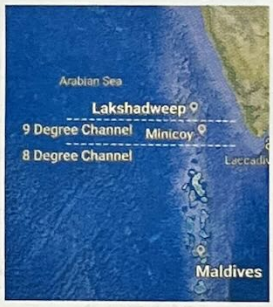
- An island is a piece of land that is completely surrounded by water and is smaller than a continent.

Islands of India

- *India has two major island groups: Lakshadweep Islands* (in the Arabian Sea) and *Andaman* and *Nicobar Islands* (in the Bay of Bengal).

1. Lakshadweep Islands: It was formed from coral deposits, making them classified as *"coral islands"*.

- Andaman & Nicobar Islands have more coral deposits than Lakshadweep.



- *Total islands: 36.*
- *Largest island: Andrott Island.*
- *2nd largest island: Minicoy.*
- *Smallest island: Bitra*
- *Latitudinal Extent: 8°N-12°N*
- *Longitudinal Extent: 71°E-74°E*
- *Area of Lakshadweep: 30-32 square kilometers.*

- The group of Islands of Lakshadweep, which are located above the 11° channel is known as Aminidivi. (Including Bitra, Andrott, Amini, Kadmat etc.).
- The group of islands located below the 11° channel, is called Cannanore. (Including Kavaratti, Suheli, Agatti, Kalpeni etc.).

2. Andaman and Nicobar Islands: They are considered as a submerged extension of the *Arakan Yoma mountain range (Myanmar)*.

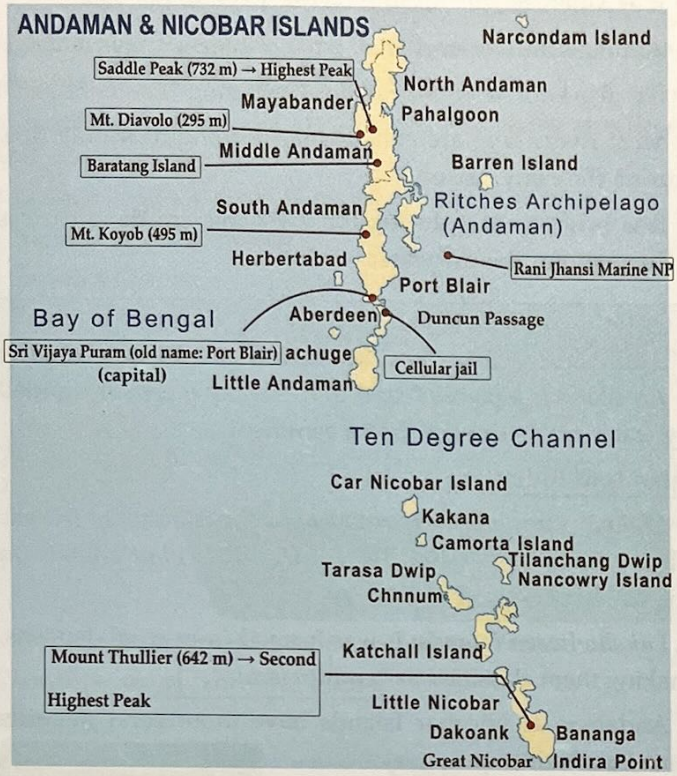
- *Total Islands: 572.*
- *Largest Island: Middle Andaman.*
- *Latitudinal Extent : 6°N-14°N*
- *Longitudinal Extent : 92° E-94°E.*
- *Area of Andaman & Nicobar: 8,249 square kilometers.*

A Group of Islands is called Archipelago

- *Barren Island* is *India's only active volcano* located northeast of South Andaman, while Narcondam is a dormant volcanic island located further north.

ANDAMAN AND NICOBAR ISLANDS

Highest Peaks in Andaman and Nicobar Islands



Important Passages and Channels

Channel/Passage	*Separates*
10° Channel	Andaman and Nicobar group of islands OR Little Andaman and Car Nicobar
Duncan Passage	South Andaman and Little Andaman
Coco Channel	A&N Islands and Myanmar

Indigenous Tribes

- ***Andaman:*** North Andamanese, Jarawa, Onge, Sentinelese.
- ***Nicobar:*** Shompen, Nicobarese.

Renamed Islands in Andaman & Nicobar

- ***Ross Island → Netaji Subhas Chandra Bose Island.***
- ***Neil Island → Shaheed Dweep.***
- ***Havelock Island → Swaraj Dweep.***

National Park	*Location*
Saddle Peak NP	North Andaman
Mount Harriet NP	South Andaman
Mahatma Gandhi NP	South Andaman
Rani Jhansi Marine NP	Ritchie's Archipelago
North Button Island NP	North Andaman
Middle Button Island NP	Middle Andaman
South Button Island NP	South Andaman
Campbell Bay NP	Great Nicobar
Galathea Bay NP	Great Nicobar

LAKSHADWEEP

Important Channels of Lakshadweep

Channel/Passage	*Separates*
8° Channel	Lakshadweep and Maldives OR Minicoy and Maldives
9° Channel	Lakshadweep and Minicoy
11° Channel	Aminidivi and Cannanore

Islands along the West Coast: (Arabian Sea)

1. ***Diu Island:*** It was a Portuguese colony, now part of the Union Territory of Dadra and Nagar Haveli and Daman and Diu.
2. ***Piram Bet Island:*** An island in the Gulf of Cambay (Khambhat), Gujarat.
3. ***Bet Dwarka (Beyt Dwarka):*** An island near Dwarka, Gujarat, with strong mythological significance in Hinduism.
5. ***Alia Bet Island:*** *Gujarat* → River island in the delta of *Narmada river* (situated near *Gulf of Khambhat*).
6. ***Elephanta Island:*** Famous for the Elephanta Caves (Shavite, also a UNESCO World Heritage Site), located in Mumbai Harbour, Maharashtra.
7. ***Salsette Island:*** Cities of Mumbai and Thane are located on it, making it one of the most populous islands in the world.
8. ***Vengurla Rocks (Burnt Islands):*** A small group of rocky islands off the coast of Maharashtra.
9. ***St. Mary's Islands:*** A group of four small islands off the coast of Malpe, Karnataka, famous for their unique columnar basaltic rock formations.

Island Along the East Coast: (Bay of Bengal)

1. ***Sagar Island (Gangasagar):*** A large island in the Ganges Delta, West Bengal, a significant Hindu pilgrimage site.
2. ***New Moore Island (Purbasha Island):*** A small, uninhabited sandbar island in the Bay of Bengal, which was disputed between India and Bangladesh. It has now largely disappeared due to rising sea levels.
3. ***Abdul Kalam Island (Wheeler Island):*** An island off the coast of Odisha, primarily used as a missile testing facility by India.
4. ***Sriharikota:*** A barrier island off the coast of Andhra Pradesh, home to the Satish Dhawan Space Centre (SDSC), India's primary orbital launch site.
5. *Parikund Island:* Odisha.

Riverine Islands:

1. ***Majuli Island:*** Located in the Brahmaputra River in Assam, it was once one of the largest riverine islands in the world.
2. ***Srirangam Island:*** Located in the Kaveri River in Tamil Nadu, famous for the Ranganatha Swamy Temple.

Other Notable Islands/Island Groups:

- ***Pamban Island (Rameswaram Island):*** Located between mainland India and Sri Lanka, it's famous for the town of Rameswaram and the Ramanatha Swamy Temple, as well as the historic Pamban Bridge.
- ***Gulf of Mannar:*** It is between south-eastern tip of ***India*** and ***West coast*** of ***Sri Lanka*** in ***Coromandel coast*** region.
- ***Chorao Island:*** A beautiful island in Goa, known for its Dr Salim Ali Bird Sanctuary.
- ***Divar Island:*** Another picturesque island in Goa.
- ***Katchatheevu Island*** (small uninhabited island in ***Palk Strait)***: Between ***India*** and ***Sri Lanka*** (Disputed).
- ***Sir Creek Line:*** Between ***India*** and ***Pakistan*** (Disputed).

Some Facts

- The southwestern portion of ***Palk Strait*** is ***Palk Bay***.
- ***Satish Dhawan Space Centre (SDSC)*** → in ***Sriharikota, Andhra Pradesh,*** is the primary launch site of the Indian Space Research Organisation ***(ISRO)***.
- On January 23, 2023, ***PM Narendra Modi*** renamed ***21 unnamed islands*** of Andaman and Nicobar in honor of ***Param Vir Chakra (PVC) awardees***.
- ***Pygmalion Point***, now known as ***Indira Point***, is the ***southernmost point*** of Indian territory that is located in the ***Great Nicobar Island of Andaman and Nicobar Islands***.

The Great Channel (or Six Degree Channel) separates India's Nicobar Islands (specifically Great Nicobar Island) from Indonesia's Sumatra Island.

DRAINAGE PATTERN

• Drainage pattern refers to the system of flow of surface water mainly through the forms of rivers and basins.

• The drainage system depends upon factors such as slope of land, geological structure, amount of volume of water and source of water.

• ***Drainage Basin:*** It is the entire area drained by that river as well as its tributaries and distributaries.

• ***Watershed:*** A watershed is a land area that channels rainfall and snowmelt to creeks, streams, and rivers, ultimately draining into larger bodies of water like reservoirs, bays, or oceans.

• Haryana & Delhi lie in the watershed region between Sutlej & Ganga river basin.

• ***Catchment Area:*** A land area where all the water from precipitation, such as rain and snowmelt, drains into a common outlet like a river, lake, or ocean.

Different Drainage Pattern

There are four types of drainage patterns formed by a river: Dendritic, Trellis, Radial, and Centripetal pattern.

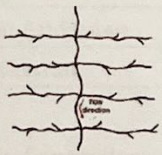
Dendritic

• The most common drainage pattern that resembles a *tree's branching roots*.

• It occurs when a stream receives water from tributaries, which are fed by smaller tributaries. Tributaries join larger streams at *acute angles* (less than 90°).

Eg. ***The rivers of the Northern Plains: Indus, Ganga and Brahmaputra.***

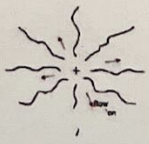
Trellis



• This type of drainage pattern is formed when primary tributaries of the main river flow *parallel to each other* and secondary tributaries join them at *right angles*.

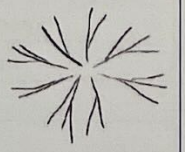
Eg. ***Rivers of originating at Chota Nagpur and rivers in the upper Himalayan region: Damodar river, Indus river, etc.***

Radial



This type of drainage pattern is a pattern of steams and rivers that radiate outward from a central high point. It's common around volcanoes and other conically shaped features. **Eg.** ***The rivers like Narmada, Son and Mahanandi originating from Amarkantak Hills are examples of drainage pattern.***

Centripetal



• It is the opposite of the radial pattern.

• The steams flow toward a *central depression/basin.* **Eg.** ***Loktak Lake (Manipur).***

Types of Rivers Based on Relation to Land Slope and Structure

• ***Consequent River:*** A river that flows along the general direction of the land's slope.

• ***Subsequent River:*** A tributary stream that forms after the main drainage pattern, eroding along a belt of weaker rock.

• ***Obsequent River:*** A tributary that flows in the opposite direction to the main, or consequent river.

• ***Resequent River:*** A stream that flows in the same direction as the original consequent river but originates at a much later stage.

INDIAN DRAINAGE SYSTEM

The Indian river system can be broadly classified as:

1. Himalayan River System

2. Peninsular River System

• They are *perennial* rivers (flow throughout the year) and do not depend on monsoon for their water flow.

• They originate from *glaciers* in the Himalayas.

• They have long courses from source to the sea.

• ***Three major Himalayan Rivers are:*** *Indus, Ganga, Brahmaputra* (originating from northern mountain ranges).

• Some Himalayan rivers are *antecedent* (they follow their original course despite geological changes). **Eg.** ***Sutlej, Kosi, Indus, Brahmaputra.***

Peninsular River System

• They are *ephemeral* (they are seasonal rivers).

• They have shorter and shallower course.

• ***Some major Peninsular Rivers are:*** *Narmada, Tapi, Godavari, Krishna, etc.*

Now, Let us Learn about Himalayan Rivers!

INDUS RIVER SYSTEM

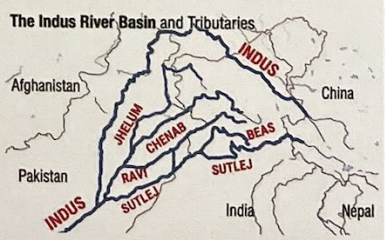
• **Length:** *2,880 km* (1,114 km in India).

• **Origin:** *Bokhar Chu Glacier* (Tibet) in the Kailash mountain range near Lake Mansarovar and it enters India at *Demchok* (Ladakh).

• Flows through: ***China → India → Pakistan.***

• ***Drains into: Arabian Sea.***

• In Tibet, it is known as *'Singi Khamban'* (meaning: Lion's mouth).



Tributaries:

• ***Left Bank:*** Jhelum, Chenab, Ravi, Beas, Sutlej.

• ***Right Bank:*** Shyok, Gilgit, Hunza.

• *Leh* is located on the banks of Indus river.

Indus Water Treaty (1960)

This treaty was signed between *India (Jawaharlal Nehru)* and *Pakistan (Mohammad Ayub Khan)* in Karachi (mediated by the World Bank) in 1960.

It has been *suspended by India* in *2025* after *Pahalgam attack*.

The Treaty Allocates the Rivers to the Countries:

- ***Western Rivers:*** Indus, Jhelum, and Chenab to *Pakistan* (80% water used by Pakistan and used by India).
- ***Eastern Rivers:*** Ravi, Beas, and Sutlej to *India* (80% water used by India and 20% used by Pakistan)
- **Doab:** It refers to the area of land situated between two rivers.

Doabs Formed

- *Indus + Jhelum: Sindh Sagar Doab.*
- *Jhelum + Chenab: Jech Doab.*
- *Chenab + Ravi: Rechna Doab.*
- *Ravi + Beas: Bari Doab.*
- *Beas + Sutlej: Bist Doab.*

> • *Panchnad: It refers to the confluence of five rivers in Punjab → Jhelum, Chenab, Ravi, Beas, Sutlej*
> • *These five rivers meet with the Indus in Mithankot, Pakistan.*

Tributaries of Indus River

Jhelum

- Jhelum river meanders in its youthful stage.
- *Ancient Name: Vitasta.*
- *Origin: Verinag* (Jammu & Kashmir)

> • *Jhelum is also known as "Vyath" in Kashmir.*
> • *Jhelum is also known as "Hydaspes" in Greek.*
> • *Battle of Hydaspes : Between Alexander & Porus in 326 BC.*

- Srinagar is located on the bank of Jhelum river.
- Wular lake *(largest freshwater lake in India)* is fed by Jhelum river.

Chenab

- Chenab river is formed by the confluence of two rivers → *Chandra* and *Bhaga* **at Tandi (HP)** in Lahaul Valley.
- *Ancient Name: Askini.*
- *Origin: Baralacha La Pass*
- It is the *largest tributary* of Indus.

> • *Chenab River Bridge in Reasi district of J&K is part of Udhampur-Srinagar-Baramulla Rail link Project.*
> • *Height: 359 m*
> • *Length: 1315 m*

Ravi

- *Ancient Name: Purushni.*
- *Origin: Rohtang Pass.*
- It is a *transboundary river* → it flows through both India and Pakistan.

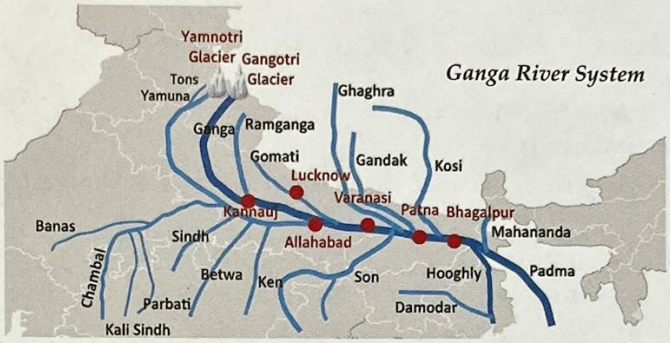
Beas

- *Ancient Name: Bipasha.*
- *Origin: Rohtang Pass.*
- It is the only tributary of Indus that *does not enter Pakistan*. It joins sutlej near *Harike* (Punjab).

Sutlej

- *Ancient Name: Shutudri.*
- *Origin: Rakshastal Lake* (Mansarovar Lake, Tibet).
- It enters India through Shipki La Pass.
- It is the *longest tributary* of Indus river.
- In Tibet it is known as *Langqen Zangbo.*

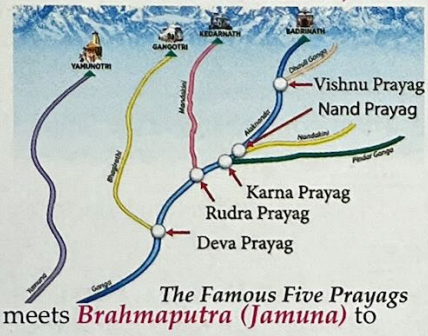
GANGA RIVER SYSTEM



- *Length: 2,525 km* (*longest* river and has the *largest* river basin in India).
- *Origin: Gangotri Glacier* (Gaumukh, Uttarakhand).
- *Drains into:* Bay of Bengal.
- Ganga was declared as *National river of India* in *2008*.
- The water from Ganga stored in bottle remains fresh due to the presence of *Bacteriophage viruses*.
- *Endangered species found in Ganga: Susu Dolphins.*
- **It passes through:** *Uttarakhand, Uttar Pradesh (longest), Bihar, Jharkhand (shortest),* and *West Bengal.*
- **Major cities on the banks of Ganga:** Kanpur → Prayagraj → Varanasi → Patna (in west to east order).

Famous Confluences (Prayags) Formed:

- *Devprayag: Alaknanda + Bhagirathi (meets to form Ganga).*
- *Rudraprayag: Alaknanda + Mandakini.*
- *Karnaprayag: Alaknanda + Pindar.*
- *Nandaprayag: Alaknanda + Nandakini.*
- *Vishnuprayag: Alaknanda + Dhauliganga.*
- Ganga splits into two branches near *Murshidabad, West Bengal* → *Padma river* (flows through *Bangladesh*) and *Bhagirathi-Hugli river* (flows through *West Bengal*).



The Famous Five Prayags

- The Ganga is known as Padma (in Bangladesh), where it meets *Brahmaputra (Jamuna)* to form *Meghna* river and finally drains into *Bay of Bengal* forming *Sundarban Delta*.

Farakka Agreement (12th December 1996)

- It is a treaty between *India* and *Bangladesh* to share the Ganges river water at the *Farakka Barrage* where it divides into *Hugli* river and it became operational on *April 21, 1975*.
- ***Mayurakshi, Kangsabati, Damodar,*** and ***Rupnarayan*** are tributaries of Hugli.

Tributaries of Ganga

Right Bank Tributaries:

Yamuna

- ***Length:*** *1,370 km* (*longest* tributary of Ganga in the Northern Plains).
- ***Origin:*** *Yamunotri Glacier, Bandarpunch Peak* (Uttarakhand).
- ***Tributaries: Chambal, Sindh, Betwa, Ken, Tons (largest tributary of Yamuna).***

Chambal River (Tributary of Yamuna)

- *Originates from Mhow Plateau (Janapav Hills) of Madhya Pradesh.*
- *It is well-known for its badland topography (due to ravines formed by gully erosion).*
- *Tributaries: Banas, Shipra, Kali Sindh, Parvati.*

Son/Sone River

- ***Origin:*** Amarkantak Plateau (it forms a radial drainage pattern).
- ***Tributaries: North Koel, Rihand.***
- It joins at just above Patna.

Punpun

- ***Origin:*** Palamu district of Jharkhand.
- It joins Ganga at *Fatuha* near Patna.

- *Ganga Plains lies between Ghaggar and Teesta river.*
- *River Ganga divides Bihar into two parts.*

Left Bank Tributaries:

Gomti

- **Origin:** Fulhar lake (Uttar Pradesh).
- It joins Ganga at *Kaithi, Ghazipur* (Uttar Pradesh).

Ghaghra

- **Origin:** Mapchachungo glacier (Tibet).
- It is also known as Karnali in Nepal.
- It joins Ganga at Chapra (Bihar).
- **Tributaries:** Sharda, Tila, Seti, Beri.

Sharda (also known as Goriganga)

- Origin: Milam Glacier.
- It is also known as *Kali* river.

Gandak

- **Origin:** Nhubine Himal glacier (Nepal).

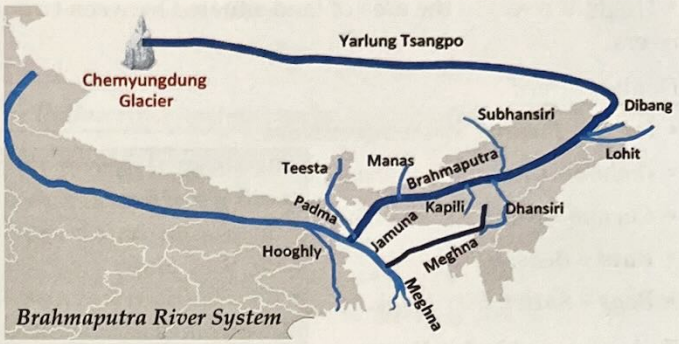
Kosi

- **Origin:** Nepal Himalayas. It is formed by the confluence of Sun Kosi, Arun Kosi, Tamur Kosi.
- It is also known as *"Sorrow of Bihar"*, as it brings frequent floods.
- It joins Ganga at *Katihar* district (Bihar).
- ***Kosi Agreement (25th April 1954):*** It was signed between India and Nepal to build and manage the Kosi Barrage for flood control, irrigation, and power generation.

Ramganga

- **Origin:** Dudhatoli ranges (Pauri Garhwal).
- It joins Ganga at Kannauj, Uttar Pradesh.
- It flows through Jim Corbett National Park.

BRAHMAPUTRA RIVER SYSTEM



Brahmaputra River System

- Length: *2,900 km* (length in India: 916 km).
- Origin: *Chemayungdung Glacier/Angsi Glacier, Tibet.*
- It makes the easternmost boundary of the Himalayas.

Names in Different Regions

- *Tibet: Yarlung Tsangpo*
- *Arunachal Pradesh: Siang/Dihang*
- *Assam: Brahmaputra*
- *Bangladesh: Jamuna*

Major Tributaries:

- ***Left Bank: Lohit, Dhansiri, Dibang, Kapili.***
- ***Right Bank: Kameng, Manas, Teesta, Subansiri, Sankosh, Raidak, Jaldhaka.***
- Teesta river originates from Tso Lhamo lake, Sikkim.
- The Brahmaputra river takes a sharp U-turn at *Namcha Barwa* (Tibet) and enters Arunachal Pradesh and then it takes a South turn at *Dhubri (Assam)*.

China is developing the world's largest dam on Brahmaputra River near Namcha Barwa range of India - Medong country mega-dam project (or Motuo Hydropower Station).

- *Majuli* **(world's largest river island)** and *Umananda* **(world's smallest river island)** is located on the Brahmaputra River.
- It forms *Sundarbans Delta* (largest delta in the world).
- The *Barak* river originating in Manipur hills, enters Bangladesh as *Surma* and *Kushiyara* rivers and later, the river is known as *Meghna* where it receives the combined flow of the *Padma* (Ganga in India) and *Jamuna* (Brahmaputra in India) rivers.
- The region of Ganga-Brahmaputra Basin lies between *10°N-30°N* latitude.
- The Dr. Bhupen Hazarika Bridge, or Dhola-Sadiya Bridge, is *India's longest river bridge (9.15 km)*, connecting Assam and Arunachal Pradesh over the Lohit River.

Cities on River

Cities	*River*
Lucknow	Gomati
Kanpur/ Allahabad/Varanasi/Patna	Ganga
Delhi/Agra	Yamuna
Jabalpur	Narmada
Ahmedabad	Sabarmati
Surat	Tapi
Ayodhya	Sarayu
Dibrugarh (Assam)	Brahmaputra
Ujjain	Shipra
Nasik	Godavari
Amravati	Krishna
Kolkata	Hugli
Lucknow	Gomti
Hyderabad	Musi
Kota/Gwalior/Dholpur	Chambal
Srinagar	Jhelum
Ludhiana	Sutlej
Jamshedpur	Subarnarekha
Vijayawada	Krishna

PENINSULAR RIVERS

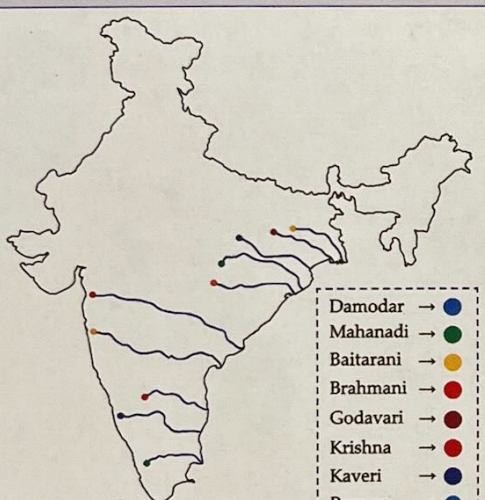
• The Peninsular Rivers originate in the Deccan Plateau, flowing into the Bay of Bengal or the Arabian Sea. They are seasonal/ ephemeral, relying on monsoon rains, with shorter courses and gentler slopes than Himalayan Rivers.

Based on the direction of flow, they are divided into two categories

1. **East Flowing Rivers:** These rivers flow from *West to East* due to the natural tilt of the Deccan Plateau and drain into the *Bay of Bengal*. They *form delta*. **Eg.** ***Damodar, Subarnarekha, Mahanadi, Godavari, Kaveri, Krishna, Pennar, Baitarani and Brahmani.***

2. **West Flowing Rivers:** These rivers flow from *East to West* and drain into the *Arabian Sea*. They *form estuary*. **Eg.** ***Narmada, Tapti, Mahi, Sabarmati, and Luni rivers.***

EAST FLOWING RIVERS



East flowing Peninsular Rivers

Damodar

• The Damodar River originates and *flows through the rift valley* in the Chotanagpur Plateau of Jharkhand.

• It flows through Jharkhand and West Bengal before joining the Hugli River (a distributary of the Ganga).

• It is also known as *"Sorrow of Bengal"* because of devastating floods it causes in West Bengal.

• **Tributaries:** Bokaro, Barakar, Konar.

Subarnarekha

• Subarnarekha River originates in the *Ranchi Plateau of Jharkhand.*

• It flows through Jharkhand, West Bengal, and Odisha.

• The river's sand contains gold particle, which is why it is named Subarnarekha (meaning "Streak of Gold").

Baitarani

• Baitarani river originates from Gonasika/Guptaganga hills in Odisha.

Brahmani

• It is formed by the confluence of the Sankh and South Koel rivers near Rourkela, Odisha (later joins Baitarani to form a delta).

Some Important Facts

• *APJ Abdul Kalam Islands* (formerly known as Wheeler Islands) is located near the mouth of Dhamra river (the confluence of Baitarani and Brahmani).

• *Bhitarkanika National Park* in Odisha is located in the delta of the Brahmani, Baitarani, and Dhamra rivers.

• *Gahirmatha Marine Sanctuary* **(world's largest)** and *Rushikulya beach* **(second largest)** are the largest nesting site for *Olive Ridley Turtles* in India.

Mahanadi

• Mahanadi river is 900 km in length and is the *3rd largest* Peninsular river.

• Mahanadi river originates from *Sihawa hills in Chhattisgarh.*

• The river flows through *Chhattisgarh* and *Odisha* before draining into Bay of Bengal. Its basin extends across Jharkhand, Maharashtra, and Madhya Pradesh.

• The Eastern Ghats start from the south of the Mahanadi River.

• **Tributaries:** Tel, Jonk, Ong, Hasdeo, Mand, Ib, and Seonath.

Godavari

• The length of Godavari River is 1465 km and is the *largest Peninsular River of South India.*

• It is also known as *"Dakshin Ganga"* or *"Vridha Ganga"*.

• It originates from *Trimbakeshwar Plateau* (Western Ghats) in Nasik, Maharashtra.

• It flows through Maharashtra, Chhattisgarh, Telangana, and Andhra Pradesh.

• The decommissioned Havelock Bridge has been built over Godavari River.

TRICK TO REMEMBER TRIBUTARIES (*M S WWI PPP*)

M	*S*	*W*	*W*	*I*	*P*	*P*	*P*
Manjira	*Sabari*	*Wainganga*	*Wardha*	*Indravati*	*Penganga*	*Purna*	*Pranhita*

• **Other Tributaries:** Pravara, Manair.

Gautami river (distributary river of Godavari) is a branch of Godavari that joins Bay of Bengal through Yanam enclave.

Krishna

• The length of Krishna River is 1400 km and is the second *longest river of South India.*

• It originates from the Western Ghats at Mahabaleshwar in Maharashtra.

• It flows through Maharashtra, Karnataka, Telangana and Andhra Pradesh.

• **Tributaries:** Bhima, Tungabhadra, Ghataprabha, Malaprabha, Musi, Koyna, Dudhganga, Yerla, Warna and Dindi.

Pennar

• The Pennar river originates from *Nandi Hills, Karnataka (Chikkaballapur)*.

• It is also known as *'Uttara Pinakini'*.

• It is an *independent flowing river* of Andhra Pradesh.

> • *Palar River & Ponnaiyar River both originate from Nandi Hills in Karnataka. Both are east flowing rivers and pass through the states of Karnataka, Andhra Pradesh and Tamil Nadu.*

Kaveri

• The length of Kaveri River is 800 km.

• It originates from *Brahmagiri Hills, Kodagu district, Karnataka*.

• It flows through Karnataka, Tamil Nadu, Kerala and Puducherry.

• It is the only river of South India that flows throughout the year (Perennial River).

• It is known as *"Ganga of South India"* (the flow of the river is like Ganga and the tributaries resemble Ganga).

• **Tributaries:** Hemavati, Kabini, Bhavani, Shimsha, Amaravati.

• The Kaveri delta is known as *"Granary of South India"*.

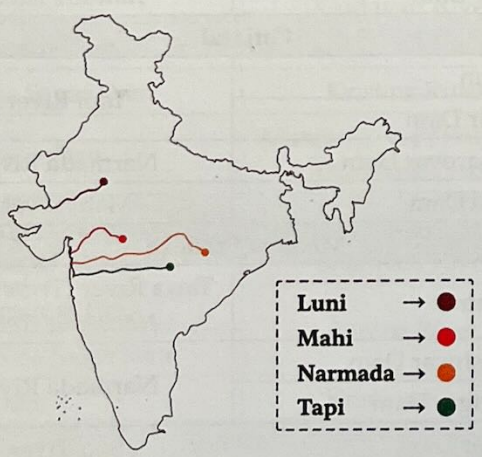
• It is known as *"Ponni"* in *Tamil Nadu*.

• It is a long-standing conflict primarily between Karnataka and Tamil Nadu over the sharing of the Cauvery River's water, which also involves Kerala and Puducherry.

Vaigai

• It is the *southernmost river* of India.

WEST FLOWING RIVERS



West flowing Peninsular Rivers

Luni

• It is also known as "Lavanavari" or "Lavanavati" river.

• It originates from *Nag Pahar/Nag hills* in the Ajmer district of Rajasthan.

• It flows through Rajasthan and Gujarat.

• The Luni River is an *endorheic river*, meaning it drains into an inland basin and does not reach the sea. Instead, it ends in the *Rann of Kutch*.

• It is the only major river in India that contains *saline water* due to its high rate of evaporation.

Mahi

• Mahi river originates from the Vindhya mountains.

• It flows through Madhya Pradesh, Rajasthan and Gujarat.

• It crosses the *Tropic of Cancer twice*.

Narmada

• The length of Narmada river is *1312 km*. It is the *longest west flowing river* that drains itself into the Arabian Sea *(flows into Gulf of Khambhat)*.

• It originates from *Amarkantak Plateau in Madhya Pradesh*.

• It flows through Madhya Pradesh, Maharashtra, and Gujarat.

• The Narmada River *flows through a rift valley between the Vindhya and Satpura* mountain ranges in India.

• **Tributaries:** Banjar, Tawa, Shakkar, Halon.

Tapi/Tapti

• The length of Tapi river is *724 km*.

• It originates from *Multai in Betul district of Madhya Pradesh* in the Satpura Range and of its basin lies in Maharashtra.

• It flows through Maharashtra, Gujarat, and Madhya Pradesh.

• Tapti river flows through a rift valley alongside Narmada *(2nd longest westward flowing river)*.

• **Tributaries:** Aner, Gomai, Purna, Bori, Girna, Arunawati.

• Surat is located on the banks of this river.

Rivers of Goa

• **Zuari river:** It forms an estuary that *meets Arabian Sea at Mormugaon Bay* in Goa.

• **Mandovi river:** It is known as *"lifeline of goa"*. It forms an *estuary* and the city of *Panaji* is located on the bank of this river.

Rivers of Kerala

• **Bharathapuzha:** It is also known as Ponnani River.

• **Periyar:** It is known as *"lifeline of Kerala"* and is the *longest river* in Kerala.

• **Pamba:** It drains into *Vembanad* lake.

River of Karnataka

• **Kali:** It is also known as *Kalinadi* river.

• **Sharavati:** *Jog waterfall* is on the Sharavati river.

• **Varahi:** *Kunchikal waterfalls (highest waterfall in India)* is on the Varahi River.

Hydroelectric Power Projects & Multipurpose Projects

• A dam is a structure built across a river to store water, generate electricity, control floods, and irrigation. Many dams in India serve multiple purposes, such as irrigation, hydroelectric power, and drinking water supply and that is why they are also known as Multipurpose Projects.

• *Jawaharlal Nehru* called dams the *"Temples of Modern India"*.

Drawbacks

• **Displacement of communities:** They displace a large number of tribals or peasants residing in the affected areas. Large-scale dam construction often leads to the forced relocation of thousands.

• Multi-purpose projects can significantly harm ecosystems. They cause *biodiversity loss*.

• These projects often create disputes between states and countries over water-sharing rights. This can lead to political tensions, legal battles, and conflicts over resource allocation.

Hydroelectric Power Generation

• In hydroelectric power plant Potential Energy of stored water is first converted to Kinetic Energy when the water falls into turbines which in turn convert it into electrical energy.

MAJOR DAMS/PROJECTS

1. Damodar Valley Project

• It is India's *first river valley project (1948)* based on the *Tennessee River Project (USA)*.

The Damodar River has four main dams:

Dams	*Location*	*River*
Maithon	Jharkhand	Barakar river
Tilaiya		
Panchet		Damodar
Konar		Konar

2. Bhakra Nangal Project

• **Built on:** Sutlej River *(during the First Five-Year Plan)*.

• It is India's *highest Gravity Dam* and the *largest dam in terms of area*.

• **It consists of two dams:** *Bhakra Dam* (located in *Himachal Pradesh*, which also forms *Gobind Sagar Lake*) and *Nangal* Dam (located in *Punjab*).

3. Hirakud Dam

• **Built on:** Mahanadi River *(Sambalpur district of Odisha)*.

• It is the *longest earthen dam in the world* (the main dam is 4.8 km long and the dam and dykes together measure 25.8 km).

4. Tehri Dam

• **Built on:** Bhagirathi River *(Uttarakhand)*.

• It is the *highest dam of India (Height: 261 m)*.

5. Farakka Dam

• **Built on:** Ganga River *(West Bengal)*.

• This dam was built to provide water to Hugli River.

STATE-WISE DAMS

Dams	*Rivers*
Jammu and Kashmir	
Dul Hasti Dam	Chenab River
Baglihar Dam	
Salal Hydroelectric Project	
Ratle Hydroelectric Project	
Kishanganga Project	Jhelum River
Tulbul Project	
Uri Project	
Himachal Pradesh	
Pong Dam *(Maharana Pratap Sagar Dam)*	Beas River
Chamera Dam	Ravi River
Baira Siul Dam	
Bassi Dam	
Nathpa Jhakri Dam	Sutlej River
Punjab	
Thein Dam *(Ranjit Sagar Dam)*	Ravi River
Shahpur Dam	
Harike Dam *	Beas + Sutlej
Uttar Pradesh	
Matatila Dam	Betwa River
Lakshmibai Dam	
Rihand Dam *	Rihand River
Uttarakhand	
Tehri Dam	Bhagirathi River
Lakhwar Dam	Yamuna River
Gujarat	
Ukai Dam	Tapi River
Kakrapar Dam	
Sardar Sarovar Dam	Narmada River
Kandana Dam	Mahi River
Madhya Pradesh	
Tawa Dam	Tawa River *(Tributary of Narmada river)*
Omkareshwar Dam	Narmada River
Indira Sagar Dam	
Ban Sagar Dam	Son River
Gandhi Sagar Dam	Chambal River

* **Rihand Dam creates** *Govind Vallabh Pant Sagar Reservoir* → *largest artificial lake of India.*
* *Indira Gandhi Canal (longest canal of India)* ***originates from Harike Dam***
• **Cofferdam:** *It is a temporary dam constructed to exclude water from a specific area.*

Rajasthan	
Mahi Bajaj Sagar	Mahi River
Rana Pratap Sagar *(at Rawatbhata)*	Chambal River
Jawahar Sagar	
Bisalpur Dam	Banas River
Maharashtra	
Jayakwadi Dam	Godavari River
Koyna Dam *(largest dam in Maharashtra)*	Koyna River
Dhom Dam	Krishna River
Ujjani Dam	Bhima River
Isapur Dam	Penganga River
Bhushi Dam	Indrayani River
Jharkhand	
Panchet Dam	Damodar River
Maithon Dam	Barakar River *(Tributary of Damodar river)*
Tilaiya Dam	
Patratu Dam	Nalkari River
Konar Dam	Konar River
Massanjore Dam *	Mayurakshi River
Chhattisgarh	
Indravati Dam	Godavari River
Hasdeo Bango Dam	Hasdeo River *(largest Tributary of Mahanadi)*
Telangana	
Pochampad Dam *(Sriram Sagar Project)*	Godavari River
Kaleshwaram Dam *	
Nagarjuna Sagar Dam	Krishna River
Nizam Sagar Dam	Manjira River *(Tributary of Godavari river)*
Karnataka	
Linganamakki Dam	Sharavati River
Shivnasamudra Dam	Kaveri River
Krishna Raja Sagar Dam	
Almatti Dam	Krishna River
Kerala	
Idukki Dam	Periyar River *(Lifeline of Kerala)*
Mullaperiyar Dam	
Tamil Nadu	
Mettur Dam	Kaveri River
Pykara Dam	Pykara River

Andhra Pradesh	
Srisailam Dam	Krishna River
Nagarjuna Sagar Dam	
Somasila Dam *(Nellore District)*	Pennar River

- **Maharashtra has the most number of Dams in India followed by Madhya Pradesh and Gujarat.**
- ✶ **Massanjore Dam is located in Dumka, which is sub-capital of Jharkhand.**
- ✶ **Kaleshwaram Dam is a lift irrigation project.**

WATERFALLS

Some Important Waterfalls of India

Name	*River*	*State*
Kunchikal *(highest waterfall: 455 m)*	Varahi	Karnataka (Shimoga)
Jog/Gersoppa/ Mahatma Gandhi *(2nd highest waterfall in India: 253 m)*	Sharavati	Karnataka
Shivnasamudra	Kaveri	
Hebbe	Bhadra	
Gokak	Ghatprabha	
Chulia	Chambal	Rajasthan
Dhuandhar and Kapildhara	Narmada	Madhya Pradesh
Hundru	Subarnarekha	Jharkhand
Dudh Sagar	Mandovi	Goa
Nohkalikai	Fed by Rain water	Meghalaya
Elephanta	Umshyrpi	
Vajrai (Bhambavli Vajrai)	Urmodi	Satara, Maharashtra
Kune	Ulhas	Maharashtra
Duduma	Machkund	Koraput, Odisha
Barehipani	Budhabalanga	Odisha
Khandadhar	Korapani Nala	
Athirappilly	Chalakudy	Kerala
Kempty	Yamuna	Uttarakhand
Sirki	Siang	Arunachal Pradesh

- **Highest waterfall in the world:** *(Angel waterfall in Venezuela: 979 m)*
- **Second highest in the world:** *Tugela Falls (in Republic of South Africa: 948 m)*
- **Niagara Falls of India:** *(Chitrakote waterfall in Chhattisgarh: 29m)*

STATE-WISE LAKES

States	Lakes
Jammu & Kashmir	• Wular Lake (***Largest freshwater lake in India***, located on ***Jhelum river*** and it was formed as a result of tectonic activity) • Dal lake ***(Jewel of Srinagar)*** • Anchar lake • Mansar lake
Ladakh	• Pangong Tso lake (In Aksai-Chin border) • Tso kar • Tso Moriri ***(All three are salt water lakes)***
Uttarakhand	• Dodital lake • Bhimtal lake • Roop Kund lake ***(Skeleton Lake)*** • Nainital lake • Suryadhar lake
Himachal Pradesh	• Govind Sagar lake • Renuka lake • Khajjiar lake • Chamera lake
Uttar Pradesh	• Keetham lake/Sur Sarovar (in Agra) - ***Man-made reservoir,*** added to Ramsar site in the year 2020. • Govind Ballabh Pant Sagar (***Largest artificial lake*** in India, located in Sonbhadra district).
Haryana	• Surajkund lake • Sultanpur lake
Punjab	• Sukhna lake (in Chandigarh, on the border of Punjab & Haryana) • Harike lake ***(wetland)*** • Ropar lake
Gujarat	• Nalsarovar lake • Rann of Kutch lake • Thol lake (Ramsar site in 2021)
Madhya Pradesh	• Bhojtal/Bhopal lake (***Asia's largest artificial lake,*** formally known as Upper lake was constructed by ***Raja Bhoj (Parmar Dynasty's*** most famous and powerful ruler, who also established Bhopal city).
Rajasthan	• Pushkar lake (in Ajmer), • Sambhar lake ***(Largest inland saltwater lake),*** (As Chilika, located in Odisha, is a coastal lake) • Jaisamand/Dhebar lake (Second largest artificial lake in Asia, located in Udaipur) • Rajsamand Lake • Lake Pichola
Bihar	• Kanwar Tal (Located on Burhi Gandak river, the largest ox-bow lake in Asia) • Gogabil lake
Odisha	• Anshupa lake • Chilika lake - ***Largest brackish water*** (freshwater + salt water) lake in India, (first ***Ramsar site to be added in the year 1981***) • Jhumka reservoir (dam as well) • Kanjila lake
Maharashtra	• Bhushi lake • Lonar lake (also called ***crater lake*** - as created due to meteorite impact, located in Buldhana district).
Kerala	• Vembanad lake (***Longest lake*** in India, Pamba river falls on it) • Sasthamkotta lake • Ashtamudi lake
Telangana	• Srisailam lake • Nagarjuna Sagar lake • Hussain Sagar lake (connects Hyderabad and Secunderabad) • Nizam Sagar lake.
Andhra Pradesh	• Kolleru lake (located between Godavari and Krishna) • Pulicat lake (located between Andhra and Tamil Nadu).
Tamil Nadu	• Pulicat lake (India's second largest brackish water lake, it is located between Andhra Pradesh and Tamil Nadu) • Kaliveli lake • Kodaikanal

Assam	• Haflong lake • Chandubi lake • Deepor Beel lake
Sikkim	• Gurudongmar lake (*Highest lake* in India) • Tso Lhamo lake/Cholamu lake • Tsomgo Chho lake
Meghalaya	• Barapani/Umiam lake in Shillong.
Manipur	• Loktak lake - *World's only floating lake* (it is famous for phumdis floating over it. Keibul Lamjao National Park (world's only floating National Park) is located here.
Tripura	• Rudrasagar lake

Some Facts

- *Largest lake in the world: Caspian Sea*
- *Highest Navigable lake in the world: Lake Titicaca (Peru & Bolivia)*
- *Deepest lake of the world: Lake Baikal (Russia)*
- *Largest Freshwater Lake in the world: Lake Superior (USA & Canada)*

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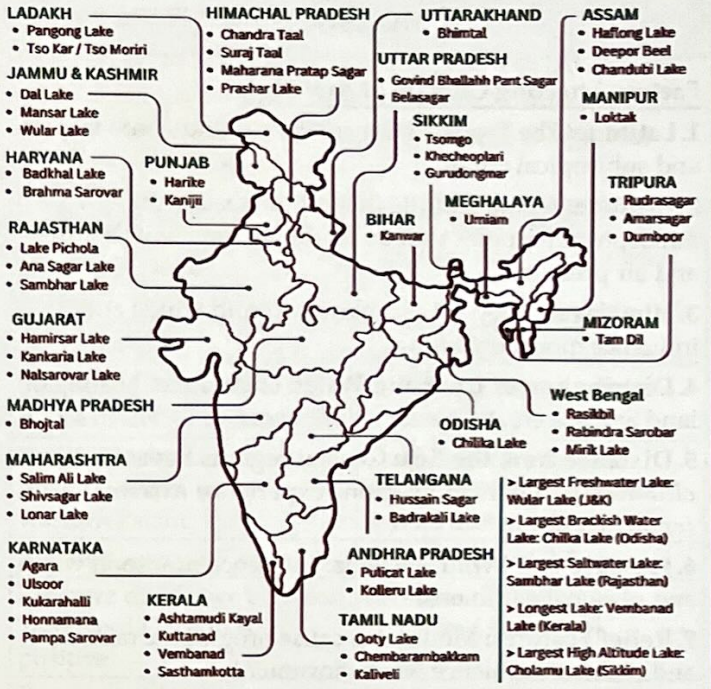


Important Lakes of India

MONSOON

Factors Affecting Climate of Any Place

1. **Latitude:** The Tropic of Cancer divides India into tropical and subtropical zones.
2. **Altitude:** As the altitude (height) increases, the atmosphere becomes thinner leading to low temperature and air pressure.
3. **Himalayas:** They act as a barrier to cold winds and influence monsoonal flow.
4. **Distribution of Land and Water:** Differential heating of land and sea create *pressure differences*.
5. **Distance from the Sea:** Coastal regions have *moderate climates*, while inland regions experience *extreme temperatures*.
6. **Pressure and Wind Systems:** Influence monsoon winds and seasonal variations.
7. **Relief Features:** Mountains cause orographic rainfall, and plateaus influence wind movement.
8. **Ocean Currents:** They influence temperature and rainfall patterns.

Climate vs Weather

- **Climate:** The average weather of a place over a long period *(30 years or more)*. It includes the average temperature, humidity, rainfall, and other weather conditions.
- **Weather:** The day-to-day short-term atmospheric conditions like temperature, wind, and precipitation.

Seasons in India

Winter Season (December-February)

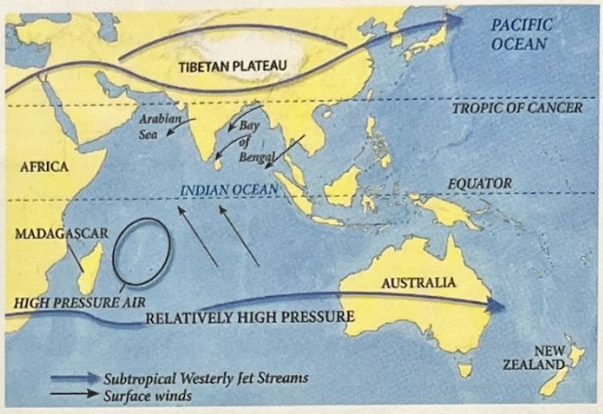
- Winter season is affected by *Cold, dry, chilling winds* from *Arctic/Central Asia*, but they are blocked to a certain extent by the Himalayas.
- **Jet Streams:** They are high-speed winds that blow in *Upper Troposphere (9-13 altitude)* that influence *Northern Plains*, this causes winter rainfall by bringing Western Disturbances (known as *"Mahawat" in Rajasthan*).
- **Western Cyclonic Disturbances:** Cyclonic storms from the *Mediterranean Sea* and *Caspian Sea* bring winter rainfall.
- Winter Rainfall is beneficial for cultivation of *Rabi crops*.

Arrival of Western Disturbances in India

- An increase in the *prevailing night temperature in winter months* in Northern parts of India generally indicates the arrival of Western Disturbances in India.

Summer Season (March-May)

- The *Inter-Tropical Convergence Zone (ITCZ)* is a *low-pressure zone* located near to equator where *trade winds converge* and air tends to ascend.
- It is shifted around *20°N-25°N latitudes* (over the Gangetic plain) in July month and is sometimes called the *monsoon trough*.
- This monsoon trough leads to the formation of *thermal low over north and northwest regions in India*.



Monsoon Winds and Subtropical Jet Streams

- Intense heating of the *Tibetan Plateau* creates low pressure, attracting winds.
- Intertropical Convergence Zone (ITCZ) shifts *northward*, leading to the onset of the *southwest monsoon* over the Indian subcontinent.
- Easterly jet streams blowing at *13-14°N latitude* on the Indian subcontinent also help in the arrival of monsoon.
- High pressure on East of Madagascar also facilitates monsoon.

Pre-Monsoon Showers

- Pre-monsoon is the period of rainfall that occurs in the *summer before the rainy season*.

Pre-Monsoon Showers across India

- **Nor westers:** They are known as *Kal Baisakhi* (calamity in the month of Baisakh) in *West Bengal* (they help in growth of *jute* and *tea* crops) and *Bardoli Chheerah/Bordoisila* in *Assam*.
- **Blossom Showers in Kerala and nearby areas:** They help in growth and cultivation of *coffee crops*.
- **Mango Showers in coastal Karnataka and Kerala:** They help in early *ripening of mangoes*.

Monsoon Season (June-September)

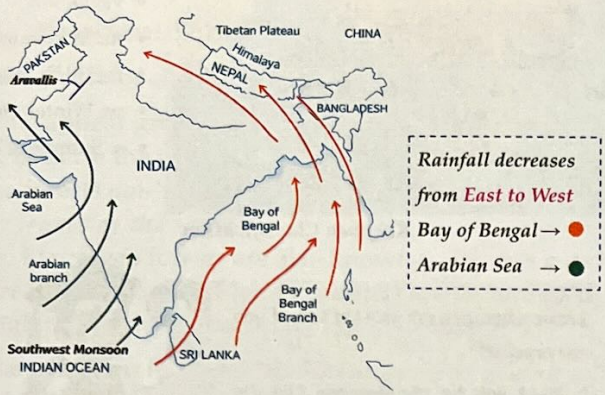
- The term "Monsoon" is derived from an *Arabic* word *"Mausim"* meaning *seasonal reversal of winds*.
- **Onset of monsoon:** It begins in *Kerala* (first week of *June*) in the Western ghats *(orographic rainfall)*.
- **Rain Shadow Zone:** Areas like Leeward side of Western Ghats *receive less rain*.

• **Southwest Monsoon is divided into two branches:** *Bay of Bengal* and *Arabian Sea Branch*.

• Both branches meet Northwest of Ganga Valley and Punjab Plains.

• **Highest rainfall recorded in:** *Mawsynram* and *Cherrapunji* (Khasi Hills of Meghalaya).

• **Break in Monsoon:** A temporary period during the monsoon season, when there is a *significant decrease* or *complete absence of rainfall*.



Orographic Rainfall

Retreating Monsoon (October-November).

• Monsoon starts its retrieval from northwest part. When it passes from Bay of Bengal it causes cyclonic disturbances and also causes heavy rainfall in *Coromandel Coast (Tamil Nadu)*. This is called *North-East monsoon* or *Retreating monsoon*.

• *"October heat"* refers to the rising temperature and humidity in India during October due to retreating monsoons and clear skies, leading to *oppressive weather conditions*.

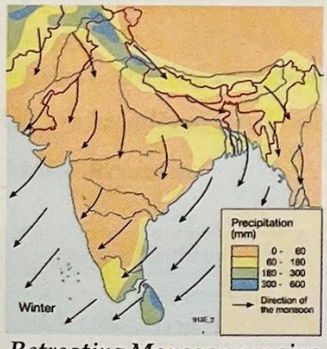
Leh on being the Rain Shadow Zone of the Himalayas experiences least rainfall.

Area of High Rainfall: Western side of Western Ghats, Meghalaya, Brahmaputra Valley.

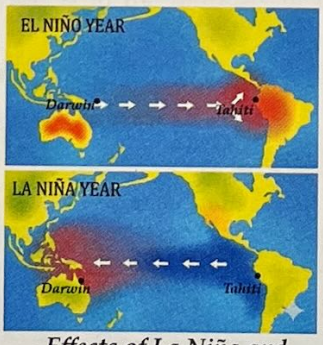
Area of Medium Rainfall: Eastern part of Tamil Nadu, North-East Peninsula, Parts of Madhya Pradesh, Cachar Valley (Assam).

Area of Low Rainfall: Western UP, Delhi, Haryana, Punjab, Jammu & Kashmir, Eastern Rajasthan.

Inadequate Rainfall: Western Rajasthan (leeward side of aravali), Ladakh.



Retreating Monsoon causing Cyclonic disturbances



Effects of La Niña and El Niño

La Niña and El Niño

• In relation to El Niño and La Niña, *Darwin* (Australia) experiences *higher air pressure* than *Tahiti* during an *El Niño*, while during a *La Niña*, the pressure is *higher* in *Tahiti* compared to *Darwin*.

La Niña	*El Niño*
Meaning: *Small girl*	Meaning: *Child Christ/Small boy*
Below average sea surface temperature in east-central equatorial Pacific (cold phase of ENSO cycle)	Above average sea temperatures in east-central equatorial Pacific (warm phase of ENSO cycle)
Trade winds strengthen, pushing warm water western Pacific	Trade winds weaken, allowing warm water to spread eastwards
It is seen every 2-7 yrs	It is seen every 3-7 yrs
Pressure difference between Tahiti and Darwin is positive	Pressure difference between Tahiti and Darwin is negative
It can cause intense rainfall in Australia and India along with heavy floods; drier conditions in South America	It can cause droughts in Asia and Australia and in the US. India experiences below average and late monsoon
Fishing industries in South America coast will flourish	Fishing industries won't flourish

ENSO: El Niño Southern Oscillation

Variation in Temperature & Rainfall

• **Diurnal Temperature Range:** It is the difference between the *highest* and *lowest* temperatures in a *24-hour period*.

• **Annual Temperature Range:** It is the difference between the average temperature of the *hottest month* and the average temperature of the *coldest month*.

• **Annual Rainfall Variation:** It is the difference in the amount of rainfall received *over a year*, either across *different regions* or within the same region over multiple years.

Continentality Effect

• It is the experience of extreme weather conditions due to *distance from the sea*.

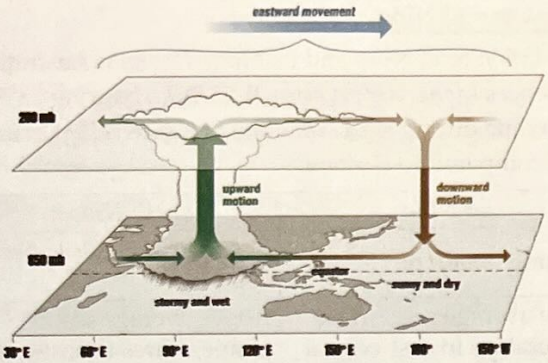
• The far we go from the ocean into the continent, the moderating influence of sea decreases and the climate becomes more extreme, this is called *continentality effect*.

→ Coastal cities do not experience extreme climate due to *"moderating influence of sea"*. **Eg. Mumbai, Chennai, Bangalore, etc.**

→ Whereas cities like *Kanpur, Delhi, Jalandhar* experiences extreme climate due to continentality effect.

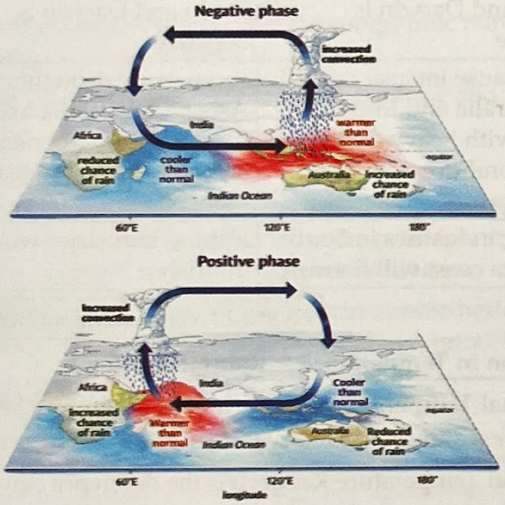
Madden-Julian Oscillation

The Madden-Julian Oscillation (MJO) is a planetary-scale, eastward-moving waves of clouds and rainfall that circles the equator every 30-60 days.



Indian-Ocean Dipole:

- Indian dipole" refers to the Indian Ocean Dipole (IOD), a climate phenomenon in the Indian Ocean characterized by a difference in sea surface temperatures between its western and eastern poles.
- Positive IOD is associated with Good Rainfall in India.

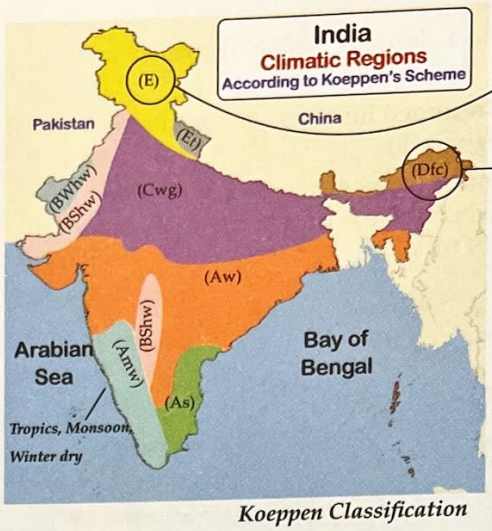


Koeppen Climate Classification (1884)

- It is an empirical classification for categorising the world's climates into *five main groups*. It's based on *average monthly* and *annual temperatures* and *precipitation*.

Classification Groups	*Characteristics*
A: Tropical	Average temperature of the coldest month is 18°C or higher
B: Dry Climate	Potential evaporation exceeds precipitation
C: Warm Temperate	The average temperature of the coldest month of the (Mid-latitude) climate years is higher than –3°C but below 18°C
D: Cold Snow Forest	The average temperature of the coldest month is –3°C or below
E: Polar Type (Cold)/Tundra	Average temperature for all months is below 10°C

Climate Codes



Koeppen Classification

Cold polar/Tundra types of climates due to extreme conditions

Cold snow forest

- S: Steppe
- W: Desert
- m: Monsoon
- f: Full Rainfall
- w: Winter Dry
- s: Summer Dry

I have a Question for you! Let's see if you can crack it!

Q. What will be the Koeppen Climatic classification of Mediterranean region located just above the Tropic of Cancer region and having no rainfall in summers?

VEGETATION/FORESTS

• India's vegetation is broadly divided into 5 groups.

1. Evergreen Forests/Tropical Rainforests

• They are layered forests (due to different stratas present in the forest).

Different Stratas in Evergreen Forest

1. **Top vertical:** Trees.
2. **Middle vertical:** Shrubs.
3. **Bottom:** Herbs and Bushes.

> *• Herbs are smaller, have soft stems, less branching.*
> *• Shrubs are taller, have woody and hard stems, are profusely branched, and are mainly perennial*

• They appear green all year because the trees in these forests *don't shed their leaves at the same time*. Evergreen forests are also known as *Deserts covered by trees* because soil of these forests is low in humus due to high rate of decomposition of organic material.

• They are seen in places of high-temperature *(above 22°C)* and high rainfall *(200 cm)*.

• In India, they are seen in western side of Western Ghats, Andaman and Nicobar Islands, North-East, Tamil Nadu coast (Dry Evergreen in Tamil Nadu & Coromandel Coast).

• *Tropical evergreen* forests have the *highest biodiversity* on Earth.

• The dry part of Evergreen Forest has Semi-Evergreen vegetation like Cedar, Hallock and Kail.

• **Vegetation seen:** *Ebony, mahogany, rosewood, rubber, cinchona* and *epiphytes*.

> *Cinchona bark is primarily known for its use in treating and preventing malaria due to the quinine and other alkaloids it contains.*

2. Deciduous Forest

• These are the most widespread forest of India and are also called *Monsoon forests*.

• They are spread over a region, receiving rainfall between *70 cm* and *200 cm*. They shed their leaves for *6-8 weeks* during summer.

• Deciduous forests are also found in the *foothills of the Himalayas*.

• Hardwood Trees are prominent here.

They are broadly divided into two categories:

1. Moist deciduous *2. Dry deciduous (Also Known as Parkland Landscape)*

Moist Deciduous	*Dry Deciduous*
Found in: Areas receiving rainfall 150-200 cm.	Found in: Areas receiving rainfall 70-150 cm.
Mostly in eastern part: Northeastern states, foothills of Himalayas, Jharkhand, West, Odisha, and Chhattisgarh and on eastern slopes of Western Ghats	Mostly in rainier part of Peninsular Plateau and plains of Bihar and Uttar Pradesh
Eg. ***Teak (most dominant), bamboos, sal, shisham, sandalwood, khair, kusum, arjun, and mulberry, etc.***	**Eg.** ***Teak, sal, peepal, neem, tendu, palas, amaltas, bel, khair, axlewood, etc.***
	*Tendu leaves are used to make Bidi. On the wetter margins, it has a transition to the moist deciduous, while in the drier margins to thorn forests.

3. Thorn Forests

• Found in: Regions with *<50cm* of rainfall.

• Thorns are modified form of leaves *(to avoid water loss)*.

• These forests are seen in *Northwestern part* of the country *(semi-arid areas)* of Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, and Haryana.

• Main plant species: *Acacias, palms, euphorbias, cacti, etc.*

• Special type of grass is seen here: *Tussocky grass (height upto: 2m).*

• Trees are scattered with long roots penetrating deep inside soil.

4. Montane Forests

• Montane forests are found in *mountainous areas*.

• In mountainous areas, the *decrease in temperature with increasing altitude* leads to the corresponding change in natural vegetation.

• These forests cover mostly the southern slopes of the Himalayas, places having high altitudes in southern and northeast India.

• There is succession of natural vegetation belts in same order as we see from *Tropical to Tundra region*.

• Montane pastures are extensively used for grazing by nomadic tribes *(Gujjars and Bakarwals)*. - Also called transhumance activity.

Succession with Changing Altitude

• **Foothills of Himalayas:** Deciduous forests.

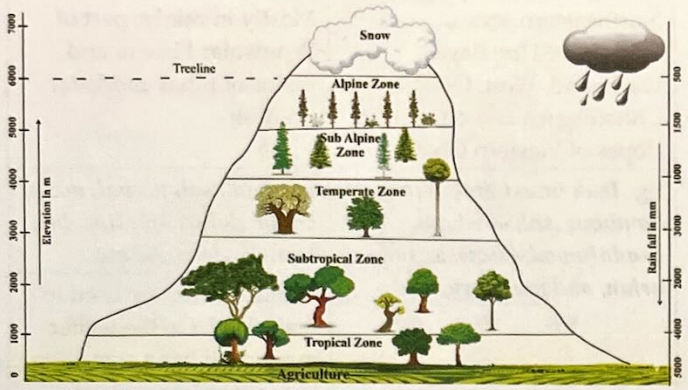
• **1000-2000 m:** Wet Temperate Forests; Evergreen Broad Leaf Trees *(Oaks, Chestnuts, etc.)*.

• **1500-3000 m:** Temperate Forests are characterized by Coniferous trees *(pine, deodar, silver fir, spruce, and cedar, etc.)*.

• **Above 3600 m:** Temperate Forests and grasslands → → Alpine vegetation *(silver fir, junipers, pines, rhododendrons, and birches, etc.)*.

• **Shrubs + Scrubs:** Alpine grasslands *(also called Bugyals)*.

- **At higher altitudes:** Mosses + Lichens *(Tundra vegetation)*.



Vegetation Zones

Southern Montane Forests

- These forests are found in three distinct areas of Peninsular India: *Western Ghats, Vindhyas, Nilgiris.*
- They are closer to tropics → Only *1500 m* above sea level.

Vegetation includes:

- **Temperate:** In higher regions.
- **Subtropical:** On lower regions of Western Ghats (Kerala, Tamil Nadu, Karnataka).
- **Temperate grasslands/forests:** They are called Sholas in Nilgiris (Western Ghats), Anaimalai and Palani hills.

5. Mangrove Forests

- They are known as *Littoral/ Swamp forests*.
- They are mostly seen in the coastal areas that are highly influenced by tides → the deltas of *Ganga*, the *Mahanadi*, the *Krishna*, the *Godavari* and the Kaveri are covered by such vegetations.
- They are found more in Sundarban delta → *Sundari trees are found here* (region: West Bengal). Palm, coconut, keora, agar trees are also found.
- The trees are *viviparous* (produce embryos that develop before detaching from the parent plant) and are also called *Pneumatophores* (living roots).

Coniferous Forests

- They are seen in areas of high snowfall → *Upper Himalayas in India.*
- The trees in coniferous forest are *cone-shaped,* which helps them to shed snow in cold climates.
- **Trees include:** Softwood trees such as *Chir, pine, cedar, deodar (Wood used in construction* activities*), spruce, etc.*

Miyawaki Forest: A dense, multi-layered forest created using a method developed by Japanese botanist Akira Miyawaki.

Biomes/Forests across the World

- **Temperate Evergreen Forests:** Found in mid-latitudinal coastal areas (US, Canada, Europe, Asia). They lie on the eastern coastal margins.
- **Temperate Deciduous Forests:** They are found between North and South of equator where *rainfall is high* (between 500-1500 mm a year) → Birds like Pheasant and Monal are found here (35°-50°N/S).
- **Taiga/Boreal Biome (untouched):** 50°-70°N/S.
- **Tundra:** Beyond 70° N/S (in Arctics).

Taiga Forest: (In Russian language, Taiga means "*pure*" or "*untouched*" land)

- Also Known as *Boreal/Subarctic Coniferous Forest*.
- **Flora:** Spruce, Pine, Fir, Moss, Lichens, and Mushrooms.
- **Fauna:** Bear, Lynx, Moose, Salmon, Owl and Mosquito.

Tundra Biome:

- The Tundra is a *cold, treeless biome* in the Arctic, Antarctic, and high mountain tops.
- **Flora:** Moss, Lichens, Grass and Low shrubs.
- **Fauna:** Polar Bear, Arctic fox, Caribou, arctic hare, snowy owl and Ptarmigan.

Temperate Deciduous

• A biome characterized by four distinct seasons, where the dominant trees are broad-leaved and shed their leaves in the autumn to conserve energy during winter.
• Birds like Pheasant and Monal are seen here.

Indian State of Forest Reports

- It is released by *Forest Survey of India (FSI)*.
- **It was first published in** *1987* (It is a *Biennial report*).
- *18th* Indian State of Forest Reports was published in: *2023*.

According to 2023 Report:

- **Forest cover:** *21.7%.*
- **Tree cover:** *3.41%.*
- **Forest + Trees cover:** *25.17%.*
- **Forest cover (area-wise):**
  Madhya Pradesh > Arunachal Pradesh > Chhattisgarh.
- **Forest cover (% wise):**
  Lakshadweep > Mizoram > Andaman and Nicobar Islands.
- **Maximum increase (Forest + Tree cover):**
  Chhattisgarh > Uttar Pradesh.
- **Maximum increase (Forest cover):** *Mizoram > Gujarat.*
- **Largest decrease:** *Madhya Pradesh > Karnataka.*
- **Indian Forest Policy (NFP) 1952 (last revised in 1988) states that:** *33%* geographical area should be under forest or tree cover.

Social Forestry

- Social forestry means the management and protection of forest and afforestation on barren lands with the purpose of helping in the environmental, social, and rural development.

Chipko Movement

- The Chipko Movement was a forest conservation movement in India.

- It began in *1973* in the *Chamoli* district of *Uttarakhand* (then Uttar Pradesh) → Led by *Sunderlal Bahuguna* along with local villagers to protect trees from being cut down by government backed commercial loggers.
- **Forest Day is celebrated on:** *21st March.*
- *Indian Forest Research Institute* is located in *Dehradun, Uttarakhand.*

GRASSLANDS

Types of Grasslands

Tropical Grasslands	*Temperate Grasslands*
They have tall, non-nutritious, elephant grass	They are short and nutritious
Different names around the world: • **Savannah:** Africa (known as Big Game country due to extreme poaching of animals) • **Campos:** Brazil • **Llanos:** Venezuela	Different names around the world: • **Prairies:** North America (known as wheat granaries of the world) Steppes: Asia / Europe • **Velds:** South Africa • **Downs:** Australia • **Pustaz:** Hungary • **Canterbury:** New Zealand • **Pampas:** Argentina (Alfalfa grass, a nutrient rich grass is seen here)

SOIL

- The study of soil is called *Pedology*.
- Soil is a renewable natural resource made up of organic (humus) and inorganic materials.

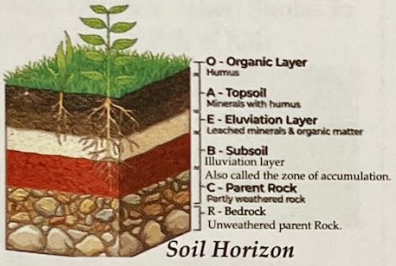
> *Humus: A soil component that is dark, organic matter from decomposing plants and animals.*

Factors Affecting Soil Formation

- **Parent Rock:** It determines *soil color, texture, mineral content,* and *permeability*.
- **Climate:** Temperature and rainfall affect the *rate of weathering* and *humus* formation.
- **Time:** It determines the *thickness* of soil layers.
- **Relief:** It affects *soil accumulation* and *erosion*.
- **Biological Factors:** Plants, animals, and microorganisms significantly affect soil formation by breaking down parent material.
- **Soil Composition:** 45% *Minerals,* 25% *Air,* 25% *Water,* and 5% *Organic Matter*.

ICAR (Indian Council of Agricultural Research)

- This institute has categorized Indian soils into *8 types*.
- **HQ: New Delhi**
- Soil can be divided into certain types on the basis of factors responsible for soil formation, colour, thickness, texture, age, chemical, and physical properties.



Soil Horizon

> *Colluvium Soil: It is loose, unconsolidated sediments that have been deposited at the base of hillslopes.*

Types of Soil in India

Alluvial Soil (40%)

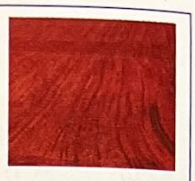
- Alluvial soil is the *most widely spread* soil in India.
- It is found in the *Northern Plains* (Uttar Pradesh, Bihar, West Bengal, Assam) and *Deltas of Peninsular rivers*.
- It is formed due to deposition of three important Himalayan river system: Indus, Ganga, and Brahmaputra.
- Alluvial soil is found in eastern coastal plains → *Deltas of Mahanadi, Godavari, Krishna, Kaveri*.

- It is rich in *potash* and poor in *phosphorus*.
- Sand content decreases from west to east of the plains.

Types

- **Old alluvium:** *Bhangar* → Calcareous concentration; poor in humus and nitrogen *(less fertile)*.
- **New alluvium:** *Khadar* → More suitable for agriculture *(more fertile)*. Its colour varies from *light grey* to *ash grey*.

Red Soil (18%) and Yellow Soil



- It is formed due to *weathering* of metamorphic rock.
- It is red due to presence of *iron oxide* in the soil.
- It develops on crystalline igneous rocks, especially in *areas of low rainfall* such as Tamil Nadu, Karnataka, Maharashtra, Odisha, Chhattisgarh and Piedmont zone of Western Ghats.
- It turns yellow when it becomes hydrated (iron oxide that gives it its red color changes form to a hydrated state, appearing yellowish).

Black Soil (15%)

- Black soil is also known as *'Regur'*.
- It is ideal for cotton cultivation **(Cotton requires 210 frost free days)**.
- Black soil is formed due to *eruption of Lava*.
- It is found in Northwestern part of Peninsular Plateau (also known as Deccan Traps) → *Maharashtra and Gujarat*.
- It is *clayey* in nature (made of extremely fine materials).
- This soil has *self-ploughing* characteristics (It develops cracks when dry and becomes sticky when moist). The soil is also *impermeable* in nature (water does not percolate easily).
- It is rich in iron, calcium carbonate, magnesium, potassium, lime, alumina and poor in humus, nitrogen and phosphate.

> **Almost all Indian soils are poor in Humus and Nitrogen.*

Laterite Soil (4.3%)

- The name is derived from Latin word *'later'* which means *'brick'*.
- Laterite soil is also considered as *deep Red Soil*.
- These are slightly acidic in nature, hence possesses very little fertility.

- It is formed as a result of *intense leaching process* (where important mineral such as silica washes away with the water).
- This type of soil is found in regions of *high temperature* and *heavy rainfall* such as Karnataka, Kerala, Tamil Nadu, Madhya Pradesh, and hilly areas of Odisha and Assam.

> *• Leaching: Leaching is a process where all important minerals of soil wash away or percolate underground.*

- Red laterite soil is found in: Tamil Nadu, Andhra Pradesh, Kerala → these regions are suitable for growing *cashew nut crops*.
- Laterite soil is also suitable for growing *tea and coffee (Karnataka)*.

> *Laterization: This happens because intense rainfall leaches away soluble minerals like silica, calcium, and magnesium, leaving behind a concentration of iron and aluminum oxides.*

Podsolization: It is a soil formation process that occurs in cool, humid climates, particularly under coniferous forests. It involves acidic water leaching (eluviation) of nutrients, iron, and aluminum from the topsoil, leaving behind a bleached, ash-like layer.

Arid Soil

- Arid soil ranges from *red to brown* in colour.
- It is generally *sandy* in texture and *saline* in nature *(rate of evaporation is greater than the rate of precipitation)*.
- Arid soil is found in parts of *Rajasthan* and *Gujarat*.
- The Kankar layer formation in bottom horizon restricts the infiltration of water.

Marshy/Peaty Soil

• Saline soil is treated with Gypsum.
• Acidic soil is treated with Lime.

- Marshy/Peaty soil is primarily found in *coastal areas* of West Bengal, Odisha, and Tamil Nadu.

- It develops in *waterlogged areas* with *high organic matter* accumulation due to decaying vegetation.
- It is also seen in regions of *high humidity* and *high rainfall*.

Alkaline Soil (also called Usar Soil)

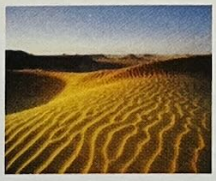
- Alkaline soil is soil with a *pH above 7*, often rich in calcium, magnesium, and sodium, which can limit nutrient availability for many plants.
- Poor water infiltration because of which water stagnates on the surface.
- **Fertility:** Low fertility because nutrients like iron, zinc, and phosphorus become unavailable to plants.
- **Distribution in India:** Common in arid and semi-arid regions like Uttar Pradesh, Punjab, Haryana, Rajasthan.
- **Crops Grown:** Hardy crops like *barley, cotton,* and certain *pulses* can survive.

Montane Soil

Loess is a type of soil that consists of silt and dust.

- Montane soil is found in mountainous region.
- This type of soil is more acidic, with decreased mineral nutrients.
- Montane soil is rich in organic matter (has high humus content).

Desert Soil



- Desert soil is dry, sandy and low in organic matter.
- It is seen in extremely *arid, low rainfall areas (rainfall: <50 cm)* → Western Rajasthan, Gujarat, Haryana.

Macronutrients vs Micronutrients (required for soil)

Macronutrients	*Micronutrients*
Nitrogen (N)	Chlorine (Cl)
Phosphorous (P)	Iron (Fe)
Potassium (K)	Boron (B)
Sulfur (S)	Manganese (Mn)
Calcium (Ca)	Zinc (Zn)
Magnesium (Mg)	Copper (Cu)
	Molybdenum (Mo)

USDA (United States Department of Agriculture) Soil Classification System

- **Entisol:** Weakly developed soil with no horizon.
- **Inceptisol:** Recently formed soil that has weakly or quickly developed horizons. It covers the largest geographical area of India.
- **Vertisol:** Vertisols are *clay-rich soil* and tend to *swell when wet* and *shrink upon drying*. They are also called inverted soils because the name comes from the Latin word vertere, which means *"to invert"*. **Eg.** ***Black soil.***
- **Alfisol:** Alfisols are a type of soil that are *rich in clay and minerals* and are found in humid and semi-arid regions.
- **Oxisol:** Oxisols are *highly weathered soils* that are mainly found in tropical and subtropical regions.
- **Gelisols:** Gelisols are soils that contain *permafrost* within *2m* of the soil surface.
- **Histosol:** Histosols are soils that are made up mostly of *organic matter*, like peat and muck. They are found in wetlands, like swamps.

SOIL EROSION AND SOIL CONSERVATION

Soil Erosion

- The *denudation* of soil cover and subsequent *washing down* is described as soil erosion.

Soil Erosion due to Water

Sheet Erosion
- When *top soil gets washed* away due to heavy shower.

Gully Erosion
- It is a permanent process when *surface water run-off cuts* deeply into soil, removing it along drainage lines.

Soil Conservation Methods

- **Contour Bunding/Ploughing:** A land management practice for marginal, *sloping and hilly land* where the soil productivity is very low. It *involves placement of the lines of stone* along the natural rises of a landscape.

• **Mulching:** The process of *covering the top soil*, with plant material, such as leaves, grass, crop residue, etc.

• **Shelter Belts:** It involves *planting rows of trees on one side* of an area that prevents the wind from eroding the soil.

• **Terrace Farming:** It is the practice of *cutting flat areas out of a hilly* or *mountainous landscape* in order to grow crops. Mostly practised in hilly regions, such as Himachal Pradesh, Uttarakhand, and certain North-Eastern provinces.

• **Strip Farming:** It is a type of farming that involves *dividing fields into long, narrow strips,* and *alternating crops* in a rotation system.

AGRICULTURE

Types of Farming

1. Primitive Subsistence Farming

- It is practised on small patches of land with the help of *primitive tools* like hoe, dao, digging sticks, and family/ community labour.
- This type of farming depends upon monsoon, natural fertility of soil, and suitability of other environmental conditions.
- It is also known as *"slash and burn agriculture"* or *"Shifting cultivation"*.

Shifting Cultivation

- This type of cultivation is not good for the environment as it causes air pollution, deforestation, and the soil loses its productivity.

Different Names across the World

- **Indonesia:** *Ladang.*
- **Mexico:** *Milpa.*
- **Sri Lanka:** *Chena.*
- **Vietnam:** *Ray.*
- **Brazil:** *Roca.*
- **Venezuela:** *Conuco.*

Different Names across India

- **North-East:** *Jhum.*
- **Western Ghats:** *Kumari.*
- **Odisha:** *Pama Dabi/Bringa.*
- **Andhra Pradesh:** *Penda/Podu.*
- **Chhattisgarh (Bastar district) and Andaman and Nicobar Islands:** *Dipa.*
- **Rajasthan:** *Waltre.*
- **Jharkhand:** *Kuruwa.*
- **Madhya Pradesh:** *Bewar/Dahiya.*

2. Intensive Subsistence Farming

- It is practised in areas with *high population pressure* on land.
- It is labour intensive farming where there is a use of *high doses of biochemical inputs* and *irrigation* to obtain higher production.
- Through *"Right of Inheritance"*, division of land among successive generation has rendered land-holding uneconomical in size.

3. Commercial Farming

- Crops are grown and animals are reared for sale in market.

> • *Truck Farming: Regions where farmers specialize in vegetables only.*

- There is a usage of *higher doses of modern inputs* such as High Yielding Variety (HYV) seeds, chemical fertilizers, insecticides and pesticides, etc., to obtain high productivity.
- **Plantation Farming:** It involves farming on large areas of land to maximize output and profits → Important crops grown: *Tea, coffee, rubber, sugarcane, banana,* etc.

> *Mixed Farming: It involves growing crops and raising livestock on the same farm. This type of farming can help farmers generate stable income.*

Mixed Cropping vs Intercropping

Mixed Cropping	*Intercropping*
Mixed cropping is when two or more crops are grown on a same piece of land without following any particular pattern	Intercropping is when two or more crops are grown on a same piece of land following a specific pattern
Seeds of two different crops are mixed before sowing	Seeds are not mixed and grown in a row format
This minimize the risk of crop failure	This increases the productivity of land

> *Zero tillage farming: A sustainable agricultural technique that plants crop directly into residue from previous crops without disturbing the soil through plowing or tilling, primarily practiced for wheat cultivation in India.*

> *Hydroponics: It is a method of growing plants without soil, using water-based mineral nutrient solutions to deliver nutrients directly to the roots.*

Different Cropping Seasons

Kharif	*Rabi*	*Zaid*
• **Sowing:** *July* • **Harvesting:** *Sept-Oct* • Kharif crops are also known as *Monsoon crops.* • **Eg.** *Rice, millets, sugarcane, jute, cotton, tobacco, maize, soybean, groundnut, etc.*	• **Sowing:** *Oct* • **Harvesting:** *April* • *Winter rainfall* is beneficial for such crops. • **Eg.** *Wheat, barley, gram, mustard, linseed, pea, rapeseed, castor, etc.*	• *Short cropping season.* • Between *May and June* • **Eg.** *Watermelon, muskmelon, cucumber, fodder crops, etc.*

Some Major Crops

> • **India's most consumed staple crops:** *Rice and Wheat*

Rice

- Rice is also known as *paddy* before processing.
- India is the *2nd largest producer* of rice after *China*.
- It is sowed in *swampy areas* → *Methane* and other gases are emitted from flooded rice fields by bacteria.
- **It requires:** High-temperature *(>25°C)* and high rainfall *(>100 cm)*.
- In Eastern India, particularly in West Bengal, the three seasons for growing rice are: *Aus* **(July-Aug)**, *Aman* **(Dec-Jan)**, and *Boro* **(March-May)**.

Wheat

- **Rain required:** *50-70 cm.*
- Sown in well *Drained Loamy* or *Clay loam* soils.
- **Temperature required** while sowing wheat is *10°C-15°C*.
- **During ripening, it requires a warmer temperature:** *21°C - 26°C*.
- Winter Rainfall is helpful to wheat farming.

Sugarcane

- **Temperature required:** *21-27°C.*
- **Rain required:** *75-100 cm.*
- Best Yield in fertile, well drained loamy or alluvial soil.
- **FRP:** Fair and Remunerative Price, similar to MSP but only for Sugarcane.

Tea

- Tea is grown in *acidic, fertile, well-drained* soil (laterite soil) with high organic matter that is *rich in humus.*
- Tea plants grow well in the shade.
- **Topmost producer:** *China > India > Kenya.*
- **Topmost producer (India):** *Assam.*

Leguminous Crops

- India is *largest consumer/producer* of leguminous crops.
- Leguminous plants have *Nitrogen Fixing Bacteria (Rhizobium)* that reside in the *roots* (symbiotic relationship) of these plants (they convert atmospheric nitrogen into ammonia which the plant can use as nutrients).
- **Eg.** ***Pulses, rajma (no nitrogen fixing bacteria are present in the roots of rajma plants), soyabeans (Top producer: Madhya Pradesh), etc.***

Millets

- Millets are also known as *Superfoods/Sri Anna.*
- **Topmost producer:** *Rajasthan.*
- **Eg.** ***Bajra, ragi (finger millets), jowar (Sorghum), etc.***

Oil Seeds

- India is *2nd largest producer* of oil seeds after *China.*
- **Topmost producer (India):** *Gujarat.*
- **Eg.** ***Groundnut, coconut, mustard, sesame, cotton seed, soyabean, etc.***

Horticulture Crops

- Horticultural crops are plants that are grown for food, medicine, aroma, or aesthetics. They include fruits, vegetables, ornamental plants, and more.
- India produces 13% of world's vegetables.
- It is associated with *Golden Revolution.*

Coffee

- *Blossom showers* help in growth of coffee.
- **Soil required:** *Laterite.*
- **Coffee bowl of the world:** *Brazil (topmost producer).*
- **India (topmost producer):** *Karnataka (Baba Budan Hills).*
- **According to 2008 data:** India produces *3.2%* of the world's coffee.
- Coffee is grown in the Western Ghats of Karnataka, Kerala, and Tamil Nadu, Andhra Pradesh, Odisha, and the North East states.
- Few widely used varieties of coffee plant: *Arabica, Liberica, Robusta.*

Fiber Crops

1. Cotton

- Cotton is cultivated on *black soil.*
- It is a fiber crop and also known as *"Silver Fiber".*
- It requires: *210 frost free days* and *6-8 months* to mature.

2. Jute

- This fiber crop is also called as *"Golden Fiber".*
- **Topmost producer:** *India (West Bengal).*
- **Topmost exporter:** *Bangladesh.*
- *Nor-westers* are considered beneficial for the growth of jute as they bring heavy rainfall which is crucial for early stages of jute cultivation.

3. Hemp.

- It is a fast-growing, annual plant that's cultivated for its strong, durable, and natural bast fibers.

4. Silk

- Silk is a natural fiber that comes from the *cocoons of silkworms,* which are raised in a process called *sericulture.*
- Silk is an animal fiber, and is one of the *strongest natural fibers.*

Irrigation and Its Types

- Irrigation is the process of supplying water to land for growing crops, lawns, and plants.

1. **Surface Irrigation:** It is an ancient and widely used method of watering crops by using gravity to distribute water across the soil surface through overland flow.

2. **Sprinkler Irrigation:** It is a method of applying water to crops and land by spraying it through a system of pipes, pumps, and nozzles, mimicking natural rainfall.

3. **Drip Irrigation:** It is a method of watering plants by slowly dripping water onto the soil at the base of the plant.

4. **Subsurface Irrigation:** It is a method that delivers water directly to a plant's root zone by placing a buried network of pipes or drip lines below the soil surface.

5. **Canal Irrigation:** It is a method of supplying water to fields through artificial channels, which are fed by sources like rivers or reservoirs.

Carbon sequestration: It is the process of capturing and storing atmospheric carbon dioxide to reduce its concentration in the atmosphere and mitigate climate change.

AGRICULTURAL REVOLUTION

Different Types of Revolution

Green Revolution

- Green Revolution first began in *Mexico* and *Latin America* (from 1940-1960).
- The term "**Green Revolution**" was given by: *William S. Gaud.*
- **Father of Green Revolution (world):** *Norman Borlaug (USA)* → he received *Nobel Peace Prize* in *1970* for his work in developing *High Yielding Varieties* (HYVs) of wheat.
- **Father of Green Revolution (India):** *M. S. Swaminathan* (received Bharat Ratna in 2024).

Phases of Green Revolution in India

- Green Revolution was introduced in India in *two phases.*

First Phase

- **Time Period:** *Mid 1960-1970.*
- The first phase was when the use of High-yielding variety (HYV) seeds was limited to wealthier states like *Punjab, Andhra Pradesh,* and *Tamil Nadu* and it was also limited to *rice and wheat.*
- **During the Third Five Year Plan (1961-1966):** *CACP* (Commission for Agricultural Costs and Prices), *FCI* (Food Corporation of India) were established in *1965.*
- In *July 1968, Indira Gandhi* released a special stamp called the *"Wheat Revolution"* to mark the progress of the Green Revolution in India.

- Under *PL-480 Scheme,* India used to import HYV seeds of wheat from *Mexico, USA* before Green Revolution.

- **IR8 (Miracle Rice):** A HYV seed of rice developed by International Rice Research Institute (IRRI) which was introduced in *Philippines* and *India.*

- *Father of Wheat Revolution: Dr D. S. Athwal.*
- *He developed a new variety of wheat known as Kaliyansona in 1967.*

Second Phase

- **Time Period:** *Mid 1970-1980*
- The second phase was when HYV technology spread to more states and crops.
- This phase focused on *increasing agricultural productivity, food security* and on *holistic development in agriculture.*
- The second phase was successful in increasing food production and reducing the dependence on food imports.
- The headquarters of the Second Green Revolution (SGR) cell is located at the *ICAR-RCER* (Indian Council of Agricultural Research-Research Complex for Eastern Region) in *Patna, Bihar.*

Drawbacks of Green Revolution

- Intensive irrigation practices depleted *groundwater levels* in many regions.
- It significantly contributed to *increased soil alkalinity* due to the widespread use of chemical fertilizers, particularly nitrogen based ones, which raised the pH level of the soil.
- It led to an *increased disparity between farmers* with large landowners and wealthier farmers benefiting disproportionately compared to small and marginal farmers.
- It benefited more to farmers who had access to *land, capital* and *technology* and it also led to the *displacement of tenant cultivators* in many cases.

GM Crops (Genetically Modified Crops)

- These are crops/plants that have had their *DNA modified* using *genetic engineering techniques.*

Eg. *Bt brinjal, Bt cotton.*

Important Agriculture Revolution in India

●	Black Revolution		Petroleum
●	Blue Revolution		Fish
●	Brown Revolution		Leather
●	Golden Revolution		Fruit / Honey
●	Green Revolution		Food Grains
●	Grey Revolution		Fertilizer
●	Pink Revolution		Onion
●	Red Revolution		Meat / Tomato
●	Silver Revolution		Egg / Poultry
●	White Revolution		Milk / Dairy
●	Yellow Revolution		Oil Seeds
●	Evergreen Revolution		Overall Development

Agriculture revolution in India

Blue Revolution

- **Father:** *Hiralal Chaudhuri* and *Arun Krishnan.*
- It was a program to *increase fish production* and aquaculture in a sustainable way.

White Revolution

- White Revolution is also known as *"Operation Flood".*
- It was a dairy development program to *increase milk production* in India.

• Launched in *1970* → led by *Amul,* a brand owned by Gujarat Cooperative Milk Marketing Federation (GCMMF)}

• **Father:** *Verghese Kurien* (Autobiography: "I Too Had A Dream"; "The Man Who Made Elephant Dance").

Yellow Revolution

• **Father:** *Sam Pitroda*

• The Yellow Revolution was an agricultural program in India that increased the production of edible oilseeds.

Types of Culture

Types	*Culture*
Vegetable farming	**Horticulture**
Silk rearing	**Sericulture**
Bee keeping	**Apiculture**
Fish farming	**Pisciculture**
Flower framing	**Floriculture**
Rearing aquatic plants and animals	**Aquaculture**
Cultivation of grapevines	**Viticulture/Viniculture**
Bird farming	**Aviculture**

You might find this interesting but did you know?
Agriculture Census is conducted at an interval of 5 years!

MINERALS

- A mineral is a natural substance of organic or inorganic origin with definite chemical and physical properties.
- It is a *homogenous* naturally occurring substance with a definable internal structure.
- Minerals are of three types: *Metallic, Non-Metallic, and Energy Minerals.*

Chernobyl disaster took place on 26th April 1986 in Ukraine, Soviet Union.

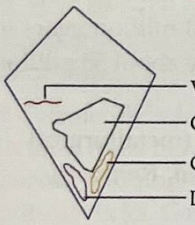
Minerals

Metallic	Non-Metallic	Energy Minerals
1. *Ferrous (containing iron):* Iron ore, manganese, nickel, cobalt, etc. 2. *Non-Ferrous*: Copper, lead, tin, bauxite, etc. 3. *Precious*: Gold, silver, platinum, etc.	E.g., Mica, salt, potash, sulphur, granite, limestone, marble, sandstone, etc.	E.g., Coal, Petroleum, Natural Gas

- *Ore: Minerals from which metals can be conveniently and profitably extracted.*
- *Gangue: The impurities (such as sand, clay, etc.) present surrounding in the ore.*

Distribution of Minerals in India

- Most of the metallic minerals in India are found in the Peninsular Plateau.
- Over *97%* of coal reserves are found in the valleys of *Damodar, Son, Mahanadi* and *Godavari.*
- Petroleum reserves are located in the sedimentary basins of *Assam, Gujarat and Mumbai High* i.e., off-shore region in the *Arabian Sea.*
- Most of the major mineral resources occur to the east of a line linking *Mangaluru and Kanpur.*



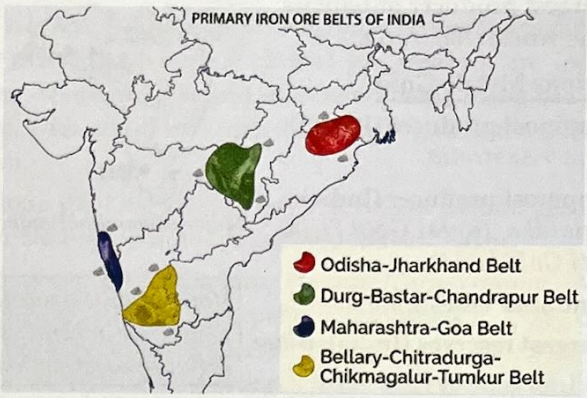
Minerals found in region
- *Gondwana: Gold*
- *Dharwad/Cuddapah: Gold, Iron*
- *Vindhyan: Non-metallic minerals*

METALLIC MINERALS

FERROUS MINERALS

Iron Ore

- *Magnetite* is the finest iron ore with a very *high content of iron* up to *70%.*
- Hematite ore is the most important industrial iron ore in terms of the quantity used, but it has a slightly *lower iron content than magnetite (50-60%).*
- In 2018-19, almost entire production of iron ore *(Approx. 97%)* came from the states of *Odisha, Chhattisgarh, Karnataka and Jharkhand.*
- **Reserve (topmost):** *Odisha.*
- **Production:** *Odisha > Chhattisgarh > Karnataka.*
- More than 72% of Magnetite deposits in India are found in Karnataka.
- *Mormugao port* is the largest exporter of iron ore.



4 Major Iron Ore Belt in India

1. **Odisha-Jharkhand Belt**
- **Jharkhand:** *Singhbhum (Region: Noamudi and Gua).*
- **Odisha region:** *Sundargarh, Mayurbhanj, Jhar.*
- **Odisha:** *Badampahar mines.*

2. **Durg-Bastar-Chandrapur Belt (Chhattisgarh and Maharashtra)**
- *Dalli rajhara, Bailadila (Chhattisgarh).*

3. **Maharashtra-Goa Belt**
- **Goa:** *Mormugao.*

4. **Bellary-Chitradurga-Chikmanglur-Tumkur Belt (Karnataka)**
- *Mangalore, Kudremukh (Chikmanglur), Baba Budan Hills.*
- *Bellary, Kemangundi, Shivamogga.*

Manganese

- Manganese is mainly used in the manufacturing of *steel* and *ferro-manganese alloy.*
- It is also used in manufacturing bleaching powder, insecticides, and paints.
- **Topmost producer (India):** *Madhya Pradesh.*
- **Odisha:** *Sundargarh deposits.*

Non-Ferrous Minerals

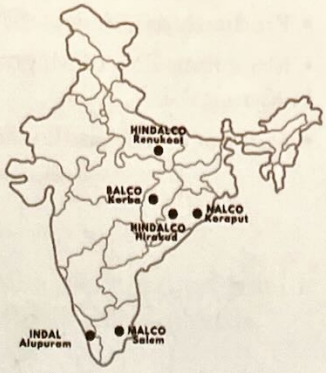
Copper

- *First metal to be discovered by humans.*
- The *Balaghat mines* in Madhya Pradesh, *Khetri mines* in Jhunjhunu and *Alwar region* in Rajasthan.
- *Singhbhum* district of Jharkhand.

Aluminium

- **Primary ore:** *Bauxite.*
- It is used in aircraft because of its *lightweight.*
- India's bauxite deposits are mainly found in the *Amarkantak plateau, Maikal hills,* and the plateau region of *Bilaspur-Katni.*

- *Odisha* is the *largest producer* of Bauxite.
- *Panchpatmali* deposits in *Koraput* district are the most important bauxite deposits in Odisha.
- **Largest producer of bauxite in the world:** *Australia.*



Major AluminiumProduction

Precious Metals Gold

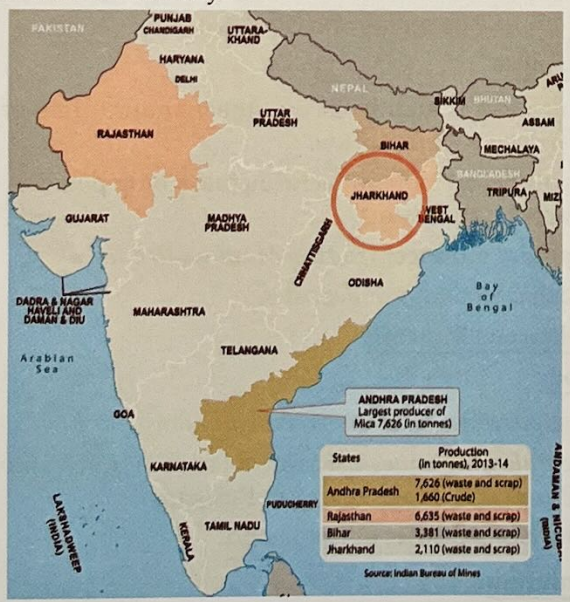
- **Topmost producer (World):** *China > Australia.*
- **Topmost producer (India):** *Karnataka, (Kolar Gold Field, Hutti Gold Field).*
- **Andhra Pradesh:** *Ramagiri.*
- **Largest reserves (India):** *Bihar.*

Hornblende is a inosilicate amphibole mineral used in highway construction.

NON-METALLIC MINERALS

Mica

- It is used in electric and electronic industries due to its excellent di-electric strength, low power loss factor, insulating properties and resistance to high voltage (consists of 4% of Earth's crust).
- Mica deposits are found in northern edge of the *Chota Nagpur Plateau*.
- *Koderma Gaya-Hazaribagh* belt of *Jharkhand* is the leading producer of Mica.
- In Rajasthan, the major Mica producing area is around *Ajmer*.
- *Nellore* mica belt of *Andhra Pradesh* is also an important producer in the country.



Largest Mica Producing States

Limestone

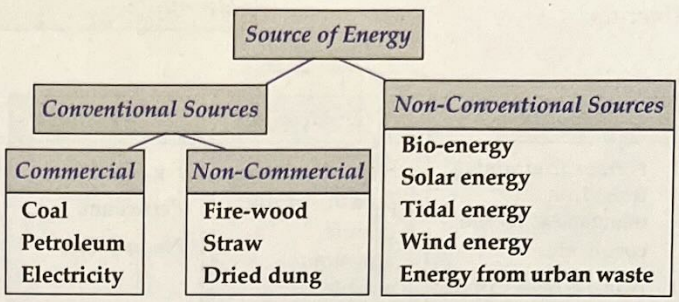
- It is a *sedimentary rock* that is found in association with rocks, composed of *calcium carbonates*, or a mixture of calcium and magnesium carbonates.
- It is a basic raw material for the cement industry and essential for melting iron ore in blast furnace.

Do you know why diamond sparkles?

Diamond

- *Madhya Pradesh (Panna)*, is the only state that produces diamond.

ENERGY MINERALS/SOURCES



Conventional Sources of Energy

- These are traditionally used energy sources, often *non-renewable* and derived from *fossil fuels*. **Eg.** ***Fossil fuels (coal, oil, natural gas) and nuclear fuel (Uranium used in power plants).***

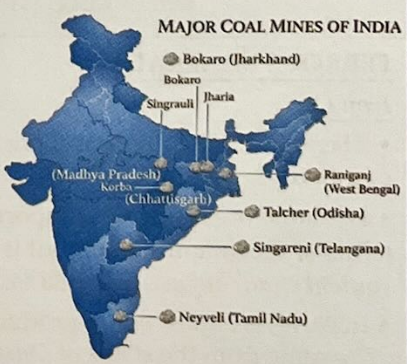
Non-Conventional Sources of Energy

- These are energy sources that are replenished naturally and can be used continuously without depletion, often referred to as *renewable energy* sources. **Eg.** Solar energy, wind energy, geothermal energy, etc.

CONVENTIONAL SOURCES OF ENERGY

1. Coal

- Coal is also known as *buried sunshine/black diamond/ black gold*.
- In India, coal is the most abundantly available fossil fuel.
- In India coal occurs in rock series of two main geological ages, namely Gondwana, a little over 200 million years in age and in tertiary deposits which are only about 55 million years old.
- The major resources of Gondwana coal (metallurgical coal) are located in *Damodar valley*. *Jharia, Raniganj, Bokaro* are important coalfields.
- The *Godavari, Mahanadi, Son* and *Wardha* valleys also contain coal deposits.
- Tertiary coals occur in the north eastern states of *Meghalaya, Assam, Arunachal Pradesh and Nagaland*.
- **Reserve (topmost):** *Odisha > Jharkhand > Chhattisgarh.*
- **Production (topmost):** *Chhattisgarh > Odisha.*



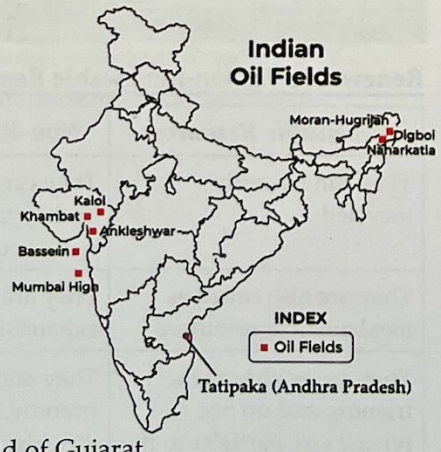
Types of Coal

- **A good coal has:** High calorific value, Low moisture content, High carbon content.
- **Anthracite:** *80-90%* carbon, Highest quality, Hard coal.
- **Bituminous:** *70-80%* carbon; coal that has been buried deep and subjected to high temperatures (also known *metallurgical coal/ coking coal*).
- **Lignite:** *50-70%* carbon; a *great brown coal* which is soft with *high moisture* content. *Neyveli* in Tamil Nadu is an important source of Lignite.
- **Peat:** *Less than 50%* carbon; decaying plants in swamps produce peat. It has a *low carbon* and *high moisture* content and *low heating capacity*.
- **Major Coal Mines of India:**

Jharkhand:	*Madhya Pradesh*	*Maharashtra*
• Jharia, Dhanbad • Bokaro • Jayanti • Godda • Giridih (Karbhari) • Ramgarh • Karanpura • Daltonganj	• Singrauli • Sohagpur • Johila • Umaria • Satpura	• Kamptee (Nagpur) • Wun Field • Wardha • Walarpur • Ghughus • Warora
Odisha	*Chhattisgarh*	*West Bengal*
• Jharsuguda • Rampia • Talcher • Ib Valley	• Korba • Bishrampur • Sonhat • Jhilmil • Hasdo-Arand	• Raniganj, • Dalingkot (Darjeeling), • Birbhum, • Chinakuri

2. Petroleum

- The majority of petroleum deposits in India are found within the rock formations of the Tertiary geological era, trapped in structures like anticlines (upward folds) and fault traps.
- Petroleum is found in fault traps between porous and non-porous rocks. Gas being lighter usually occurs above the oil.
- Mumbai High, Gujarat, and Assam are major petroleum production areas in India.



- *Ankleshwar* is the most important oil field of Gujarat.
- Assam is the oldest oil producing state of India. *Digboi* (commissioned in: *1901* and is the *1st refinery of India*), *Naharkatiya* and *Moran-Hugrijan* are the important oil fields in the state.

3. Natural Gas

- *Methane (CH_4)* is a primary component of natural gas *(70-90%)*.
- Natural Gas is found with petroleum deposits and is released when crude oil is brought to the surface.
- It is used as fuel in power sector to generate electricity. The majority of India's natural gas reserves are located in the *Mumbai High* and associated fields along the west coast, with additional reserves being found in the *Cambay Basin*.
- Along the *East Coast*, new reserves of natural gas have been discovered in the *Krishna-Godavari basin*.
- The first *1,700 km* long *Hazira (Guj)-Vijaipur (MP)-Jagdishpur (UP)* (HVJ pipeline established in *1986*) cross country gas pipeline, constructed by *GAIL (India)*, linked *Mumbai High and Bassein gas fields* with various fertilizer, power and industrial complexes in western and northen India.

> *• Ethyl mercaptan: Its primary use is as an odorant in otherwise odorless gases like natural gas and propane to act as a warning agent for leaks.*

4. Electricity

- **Hydro-energy/Hydroelectricity:** Hydroelectricity is a renewable energy source that uses the *power of moving water* to generate electricity.
- **Thermal:** It uses the power of *Coal, Petroleum and Natural Gas* to generate electricity.

> *Mundra Thermal Power Plant: Kutch, Gujarat.*

5. Thermal Energy Power Plant

- Thermal energy power plants, also known as thermal power stations are facilities that convert heat energy, often from burning fossil fuels or nuclear fission, into electrical energy, typically by using steam to drive turbines.

Thermal Power Plants of India

NON-CONVENTIONAL SOURCES OF ENERGY

1. Nuclear/Atomic Energy

• Nuclear fission is a reaction in which the nucleus of an atom splits into *two or more smaller nuclei.*

The fission process often produces gamma photons, and releases a very large amount of energy which is used to generate electric power. **Eg.** ***Uranium and Thorium mines, which are available in Jharkhand and the Aravalli ranges of Rajasthan.***

> • *Apsara: 1st Nuclear Reactor of Asia. It was set up in 1956 in Bombay. It was shut down in 2009.*
>
> • *Father of nuclear programme: H. J. Bhabha*

• *Monazite sand* of Kerala is also rich in *Thorium.*

Function of Moderator, Control Rods, and Coolant in Nuclear Reactors

Moderator

• Moderator *slows down the fast-moving neutrons* produced during fission, making them more likely to cause further fission events.

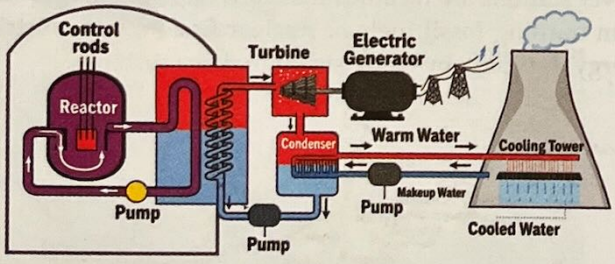
Eg. ***Common moderators include, heavy water (deuterium oxide), and graphite.***

Control Rods

• Control rods *absorb neutrons*, thus regulating the rate of fission and preventing the *chain reaction* from becoming *uncontrolled.* **Eg.** ***Control rods are typically made of boron, cadmium, silver, etc.***

Coolant

• Coolants remove the heat generated by fission, *preventing* the reactor core from *overheating* and allowing the heat to be used to *produce steam for electricity generation.*
Eg. ***Heavy water, gas like helium or*** CO_2.



A Nuclear Reactor

Nuclear Power Plants of India

• **Tarapur:** Maharashtra *(1st nuclear power plant)* commissioned in *1969.*

• **Kudankulam and Kalpakkam:** Tamil Nadu.

• **Kaiga:** Karnataka.

• **Narora:** Uttar Pradesh.

• **Rawatbhata:** Rajasthan.

• **Kakrapar:** Gujarat.

2. Solar Energy.

• It is a *renewable* source of energy.

• Solar energy is the radiant heat and light from the sun that can be harnessed to generate electricity, heat, and other forms of energy.

• *Photovoltaic technology* is a technology which converts sunlight directly into electricity.

• **HQ of International Solar Alliance:** *Gurugram.*

• **Bhadla Solar Park in Rajasthan is the largest.**

• **PM-Suryaghar Bijli Yojna:** PM Surya Ghar is a government scheme that provides subsidies for households to install rooftop solar panels, with the goal of offering up to 300 units of free electricity per month to one crore households.

3. Wind Energy.

• It is a *renewable* source of energy.

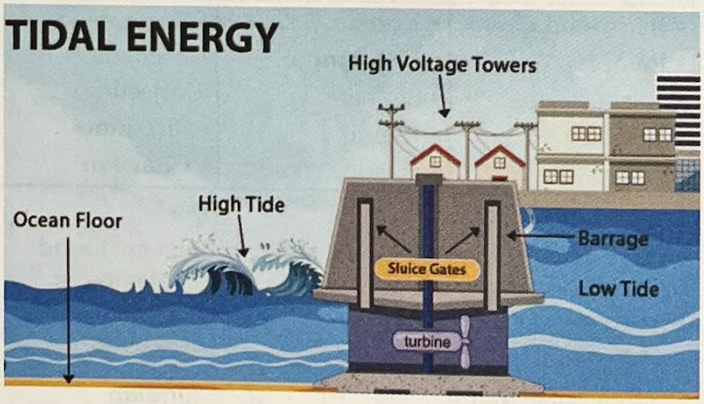
• India has a great potential of wind power.

• The largest wind farm cluster is located in Tamil Nadu from *Nagercoil* to *Madurai.*

4. Tidal Energy

• Ocean tides can be used to generate electricity.

• In India, the *Gulf of Khambhat*, the *Gulf of Kutch* in *Gujarat* on the western coast and *Gangetic delta* in Sunderban regions of West Bengal provide ideal conditions for utilising tidal energy.



Renewable Vs Non-Renewable Resources

Renewable Resources	*Non-Renewable Resources*
They can be easily recycled	They cannot be easily recycled as they take millions of years to form once exhausted
They are also called as inexhaustible resources	They are also called as exhaustible resources
They are environment friendly and do not release any particles to the atmosphere	They are not environment friendly, they release carbon dioxide, methane, and other toxic gases
They are found abundantly in nature	They are scarce in nature

- *Philosopher's stone convert all base metals like iron into gold.*
- *Approximate amount of silica present in cement is between 17% and 25%.*
- *Rock forming silicate mineral that constitutes more than 50% of Earth's crust and is used in glass and ceramic industry is Feldspar.*

5. Geothermal Energy.

- Geothermal energy refers to the heat and electricity produced by using the heat from the *interior of the Earth*.
- Two experimental projects have been set up in India to harness geothermal energy → *Parvati valley* near *Manikarn (Himachal Pradesh)* and *Puga Valley (Ladakh)*.

6. Biomass

- Shrubs, farm waste, animal and human waste are used to *produce biogas* for domestic consumption in rural areas.
- Decomposition of organic matter yields gas, which has higher thermal efficiency in comparison to kerosene, dung cake, and charcoal.
- The plants that utilise cattle dung are known as *'Gobar gas plants'* in rural India.

Anaerobic Digestion/Respiration

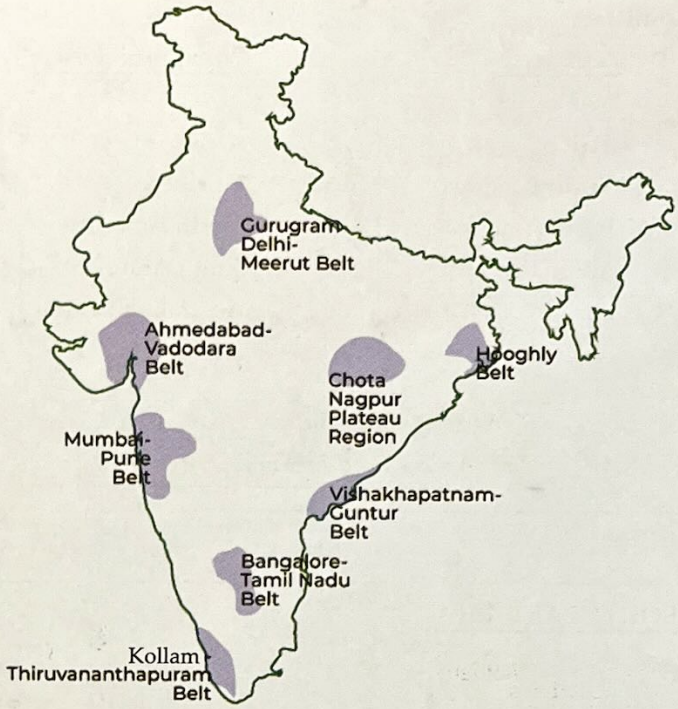
- *In anaerobic digestion/respiration, microorganism breaks down biodegradable material in absence of oxygen.*
- *Biogas is generated through anaerobic respiration.*

Biogas composition

- CO_2: *30-40%*
- CH_4: *55-70%*

Major Industrial Regions of India

- *Mumbai-Pune Industrial Region.*
- *Hugli Industrial Region.*
- *Bangalore-Tamil Nadu Industrial Region.*
- *Gujarat Industrial Region.*
- *Chotanagpur Industrial Region.*
- *Vishakhapatnam-Guntur Industrial Region.*
- *Gurugram-Delhi-Meerut Industrial Region.*
- *Kollam-Thiruvananthapuram Industrial Region.*



Major Industrial Regions in India

Continents

Area wise	Population wise
Asia	Asia
Africa	Africa
North America	Europe
South America	North America
Antarctica	South America
Europe	Australia/Oceania
Australia/Oceania	Antarctica

Decreasing ↓ (Area wise) | Decreasing ↓ (Population wise)

- *Top (Area + Population wise): Asia*
- *2nd (Area + Population wise): Africa*

ASIA

SOUTHEAST ASIA

Indonesia → *Malaysia* → *Thailand* → *Vietnam* → *Myanmar* → *Laos* → *Cambodia* → *East Timor* → *Philippines* →

Country	*Capital*
Indonesia	**Nusantara (Old: Jakarta)**
Malaysia	**Kuala Lumpur**
Thailand	**Bangkok**
Vietnam	**Hanoi**
Myanmar (Earlier-Burma)	**Naypyidaw**
Laos	**Vientiane**
Cambodia	**Phnom Penh**
East Timor	**Dili**
Philippines	**Manila**

Indonesia: It is a country with *highest Muslim population* around the world.

- Five main islands in Indonesia: *Sumatra (largest island of all), Kalimantan, Sulawesi, Java, Papua.*
- Most of the islands in Indonesia are volcanic islands.
- Java is the world's most populous island, holding over 156 million people.

Laos: It is a *landlocked* country (only surrounded by land and no ocean).

Straits

- A strait is a narrow passage of water body that connects *two large bodies of water* or *separates two landmasses.*

Strait of Malacca: It connects *South China Sea* (part of Pacific Ocean) and *Andaman Sea* (part of Indian Ocean) and separates *Malaysia* and *Indonesia.*

Sunda Strait: It connects the *Java Sea* and the *Indian Ocean* and separates the Indonesian islands of *Sumatra* and *Java.*

EAST ASIA

China → *South Korea* → *North Korea* → *Japan* → *Taiwan* → *Yellow Sea* → *Kuril Islands* → *Mongolia* →

Country	*Capital*
China	**Beijing**
South Korea	**Seoul**
North Korea	**Pyongyang**
Japan	**Tokyo**
Taiwan (Earlier-Formosa)	**Taipei**
Mongolia	**Ulaanbaatar**

China Official Language: *Mandarin*

South Korea: It shares border with *North Korea.*

South and North Korea are separated by 38th Parallel line.

North Korea: It shares borders with *China* and *Russia.*

Japan: Japan has 4 major islands: Hokkaido, Honshu, Shikoku, and Kyushu.

- Honshu is the *largest* and their capital, Tokyo, is also situated on *Honshu.*

Mongolia: It is a *land-locked* country.

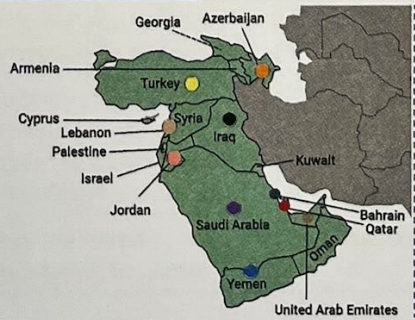
Yellow Sea: It is located between mainland *China* and *Korean Peninsula.*

Kuril Islands: This island is under territorial dispute between *Japan and Russia.*

Deserts

- Taklamakan- *largest desert of China*
- Gobi Desert- *cold desert* (China and Mongolia).

SOUTHWEST ASIA



Saudi Arabia → *Iraq* → *Yemen* → *Turkiye* → *Azerbaijan* → *Lebanon* → *Jordan* → *Qatar* → *Oman* → *UAE* →

Country	Capital
Saudi Arabia	Riyadh
Iraq	Baghdad
Yemen	Sana'a
Turkiye	Ankara
Azerbaijan	Baku
Lebanon	Beirut
Jordan	Amman
Qatar	Doha (Ad Dawhah)
Oman	Mascat
United Arab Emirates	Abu Dhabi

Turkiye: Currency: *Lira*.

- It is a *transcontinental country*, as it's spread between two continents: Asia and Europe.

Iraq: Old name of Iraq: *Mesopotamia.*

- It is referred to as *"the land between two rivers"* → *Tigris* and *Euphrates rivers*.

Mountains

- The *Caucasus Mountains* lie between the Black Sea and the Caspian Sea and act as a *natural boundary between Europe and Asia.*
- The *Taurus Mountains* are located in southern Turkey, just north of Syria, along the Mediterranean coast.

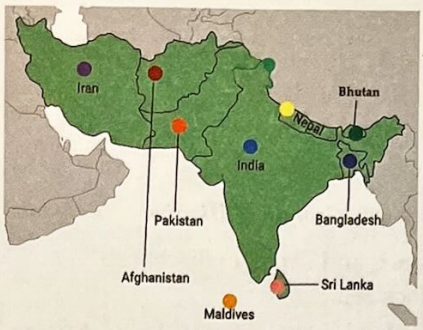
CENTRAL ASIA

Turkmenistan → ●
Uzbekistan → ●
Kazakhstan → ●
Kyrgyzstan → ●
Tajikistan → ●

Country	Capital
Turkmenistan	Ashgabat
Uzbekistan	Tashkent
Kazakhstan	Astana
Kyrgyzstan	Bishkek
Tajikistan	Dushanbe

**Liechtenstein and Uzbekistan are the only doubly landlocked countries (countries that are surrounded by landlocked countries).*

SOUTH ASIA



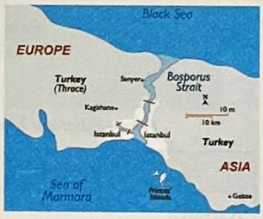
Iran → ●
India → ●
Pakistan → ●
Afghanistan → ●
Nepal → ●
Bangladesh → ●
Bhutan → ●
Sri Lanka → ●
Maldives → ●

Country	Capital
Iran (Old: Persia)	Tehran
India	New Delhi
Pakistan	Islamabad
Afghanistan	Kabul
Nepal	Kathmandu
Bangladesh	Dhaka
Bhutan	Thimphu
Sri Lanka	Sri Jayawardenepura Kotte, Colombo
Maldives	Male

Maldives: Official language: *Dhivehi.*

Sri Lanka: Capital: Sri Jayawardenepura Kotte *(Legislative capital)* and Colombo *(Judicial capital).*

Straits



Kerch Strait: It connects the *Black Sea* and the *Sea of Azov* and separates *Kerch* (in *Ukraine*) and *Russia*.

Bosphorous Strait: It connects the *Black Sea* to the *Sea of Marmara*.

Strait of Hormuz: It connects the *Persian Gulf* (west) to the *Gulf of Oman* and the *Arabian Sea* (in the southeast).

Bab-al-Mandab Strait: This strait is also known as *Gateway of Grief* or the *Gate of Tears*.

- It connects the *Red Sea* to the *Gulf of Aden*.

Palk Strait: It connects the *Bay of Bengal* to *Gulf of Mannar* and separates *India* and *Sri Lanka*.

Sea

Caspian Sea: It is surrounded by five countries *(TRICK: TARIK)*

T	A	R	I	K
Turkmenistan	*Azerbaijan*	*Russia*	*Iran*	*Kazakhstan*

- Caspian Sea is a lake and is a *landlocked* water body of *Europe* and Asia.

• Rivers *Volga, Ural, and Terek* discharge themselves into the Caspian Sea.

Black Sea: It is bordered by *six* countries *Bulgaria, Georgia, Romania, Russia, Turkiye, and Ukraine.*

(TRICK: The BuRGUR).

The	*Bu*	*R*	*G*	*U*	*R*
Turkiye	*Bulgaria*	*Russia*	*Georgia*	*Ukraine*	*Romania*

• Rivers *Danube, Dnieper,* and *Dniester* discharge themselves into the Black Sea.

Red Sea: It is bordered by *six* countries *Djibouti, Eritrea, Saudi Arabia, Sudan, Egypt, Yemen (TRICK: DESSEY).*

D	*E*	*S*	*S*	*E*	*Y*
Djibouti	*Eritrea*	*Saudi Arabia*	*Sudan*	*Egypt*	*Yemen*

Dead Sea: It is a salt water lake with highest salinity in the world.

• It is bordered by two main countries: Jordan and Israel.

TRANS-SIBERIAN RAIL LINK

• It is world's *longest rail link* with the length of *9289 km or 5772 miles.*

• It connects *Vladivostok* and *Moscow.*

Trans-Siberian Link between Moscow and Vladivostok

Country	*Capital*
Russia	Moscow
Ukraine	Kyiv

Russia: It is a *trans-continental country.*

Canals

• It is an *artificial waterway* constructed to allow the passage of boats or ships inland or to convey water for irrigation.

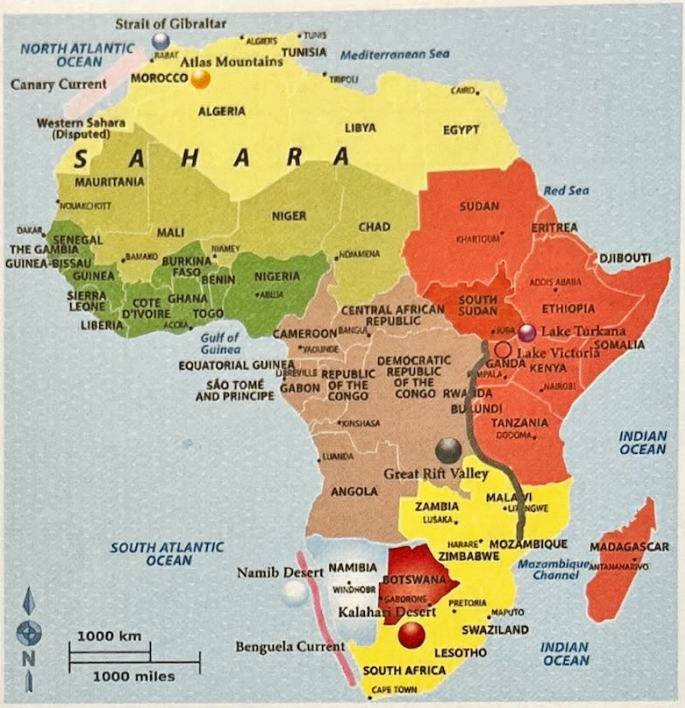
Suez Canal: It connects the *Mediterranean Sea* to the *Red Sea.*

Straits, Canal, and Sea

AFRICA

• It is known as *"Continent of Continents", "Dark Continent",* and *"Black Continent".*

• It is the only continent from where all three important latitudes pass *(Equator, Tropic of Cancer, Tropic of Capricorn).*



Country	*Capital*
Ethiopia (Old- Abyssinia)	Addis Ababa
Malawi (Old- Nyasaland)	Lilongwe
Zimbabwe	Harare
Egypt	Cairo
Zambia	Lusaka
South Africa	Cape Town, Pretoria, Bolemfontein

Egypt: It is a transcontinental country.

South Africa

• *Cape Town* (legislative capital).

• *Pretoria* (administrative capital).

• *Bloemfontein* (judicial capital).

• *Johannesburg* is famous for its vast *gold deposits.*

• *Kimberley* is world-renowned for *diamonds.*

• *Lesotho* and *Eswatini* (formerly Swaziland) are independent, landlocked nations located within South Africa.

Strait of Gibraltar →
Atlas Mountain →
Namib desert →
Kalahari Desert →
Benguela Current →
Canary Current →
Great Rift Valley →
Lake Turkana →
Lake Victoria →
Madagascar →
Egypt →

Zimbabwe and Zambia were previously known as Rhodesia.

Mountain Ranges and Peaks

Atlas: It is a series of mountain ranges located in *Northern Africa*.

Mt. Kilimanjaro: It is a *dormant volcano* and the *highest peak* of Africa (in Tanzania, capital: Dodoma).

Drakenberg Mountains: These are old fold mountains (highest mountain in *South Africa*).

Deserts

Sahara Desert: It is world's *largest hot desert* spanning across *North Africa*.

Kalahari Desert: It is located in *Southern Africa* covering *Botswana, Namibia,* and *South Africa*.

Namib Desert: It is located in west coast of *Southern Africa* covering *Namibia, Angola,* and *South Africa*.

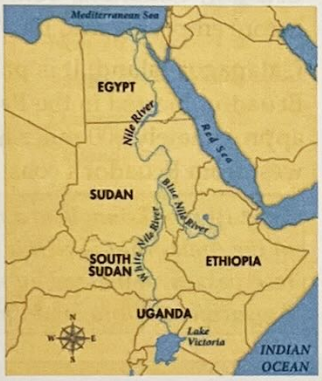
Great Rift Valley

- The Great Rift Valley is a series of continuous geographical trench that features the deepest lakes and highest mountains.
- It is one of the *most extensive rifts* on the Earth's surface that runs along the part of East Africa.
- *Lake Malawi* (Lake Nyasa) is part of it.

Rivers

Nile River: It is the *longest river* of the world.

- It is formed from *Blue Nile (origin: Lake Tana in Ethiopia)* and *White Nile (origin: Lake Victoria of Tanzania*.
- The Nile river empties at *Mediterranean Sea*.



River Nile

Congo River: It cuts the *equator twice.*

- The Congo river basin is also known as *Zaire basin*.
- The Pygmy tribe is associated with the *Congo basin*.

Orange River: South Africa's longest river.

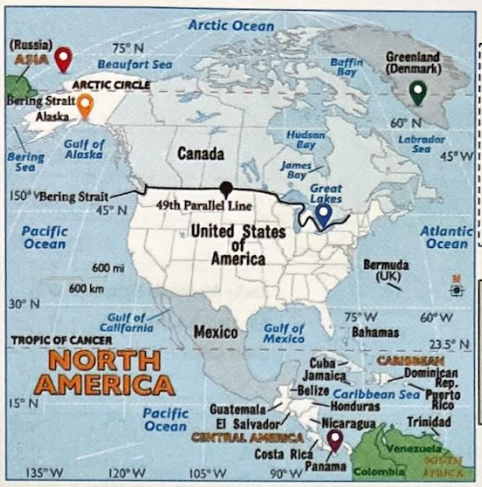
Straits

The Strait of Gibraltar: Connects the Atlantic Ocean to the Mediterranean Sea, separates *Europe (Spain)* from *Africa (Morocco)*.

Furnace Creek Ranch, Death Valley, California, USA, has recorded the highest temperature in the world.

NORTH AMERICA

Alaska: It was earlier a part of Russia. In 1867, Russia sold Alaska to the United States for $7.2 million. Now it's part of the USA.



- *The Great Lakes* →
- *Bering Strait* →
- *Panama Canal* →
- *49th Parallel Line* →
- *Alaska* →
- *Greenland* →

49th Parallel Line: **It is a boundary between USA and Canada.**

- *The Bermuda Triangle, located in the Atlantic Ocean, roughly bounded by Miami, Bermuda, and Puerto Rico.*
- *The Colorado plateau and the Great Salt Lake is located in the western part of the United States.*

Canals and Straits

Panama Canal: Panama Canal links *North America* to *South America* and separates the *Atlantic Ocean* from the *Pacific Ocean*.

Bering Strait: Bering strait connects *Arctic Ocean* to *Pacific Ocean* and separates *Asia* and *North America*.

Mountains

Rocky Mountains: They are also known as *Rockies*. They are the largest and major mountain range in *North America*.

- Highest peak Mt. Elbert.
- They are *young fold mountains*.

Appalachian Mountains: They are among the oldest mountain ranges on Earth.

- Highest peak Mt. Mitchell.
- They are *old fold mountains*.

Deserts

- Great Basin
- Mojave Desert
- Sonoran Desert
- Chihuahuan Desert

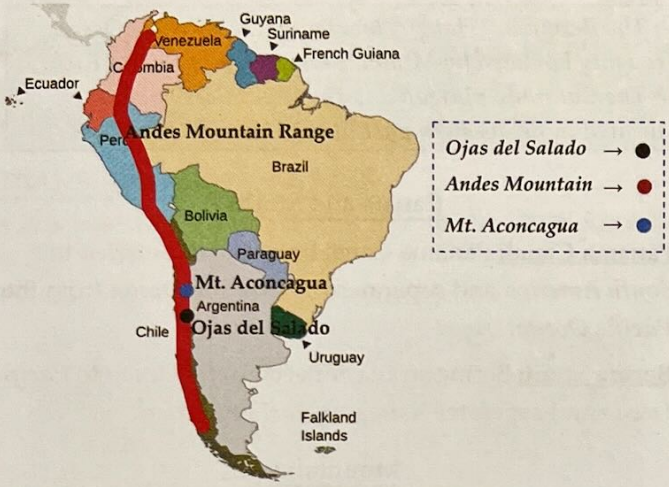
CANADA

- Canadas has the *most no. of natural lakes* in the world.

H: Lake Huron
O: Lake Ontario
M: Lake Michigan
E: Lake Erie
S: Lake Superior (world's largest freshwater lake)

These lakes are known as "The Great Lakes" and are shared by both USA and Canada.

SOUTH AMERICA



Country	Capital
Chile	Santiago
Argentina	Buenos Aires
Paraguay	Asuncion
Bolivia	Sucre
Uruguay	Montevideo
Brazil	Brasilia
Venezuala	Caracas

Brazil: Currency: *Brazilian Real*.

- It is the largest country of South America.

South America has only two landlocked countries: Bolivia and Paraguay.

Mountains

Ojas del Salado: It is the *highest mountain* (dormant complex volcano) in the *Andes* range on *Argentina-Chile* border.

Mt. Cotopaxi: It is located in the Andes mountains of *Ecuador*.

Andes Mountain Range: It is the *longest chain of mountain range* on land that runs along the western coast of *South America*. It is a *young fold mountain range*.

- It passes through seven countries: Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, and Argentina.

Mt. Cotopaxi and Mt. Chimborazo are two active volcanoes located in Ecuador.

Deserts

Atacama Desert: It is the *driest desert* located in *Northern Chile* bordered by *Pacific Ocean* (west) and *Andes Mountains* (east).

Patagonian Desert: It is located in Argentina.

Lakes

Lake Titicaca: It is the world's *highest navigable lake*, situated in the Andes mountains on the border of Peru and Bolivia.

Lake Maracaibo: It is located in Venezuela (*South America's largest lake*). It is also one of the world's oldest (formed 36 million years ago), that's why it's rich in oil and gas resources and is known as the "*oil lake*".

Rivers and Islands

Amazon River: It is the world's *largest river by volume* and *second-longest river*, originates from Peru, flows through Ecuador, Colombia, Venezuela, Bolivia, and mainly Brazil before emptying into the Atlantic Ocean.

Galapagos Island: It is part of Ecuador, located in the Pacific Ocean approximately 600 miles away in the west,from Ecuador's coast.

The Lithium Triangle is a region of the Andes that is rich in lithium reserves, encompassed by the borders of Argentina, Bolivia, and Chile.

EUROPE

Russia: Russia is considered a part of both *Europe* and *Asia*.

Greenland: It is the *world's largest island*, located in the North Atlantic Ocean, and it is an autonomous territory within the Kingdom of *Denmark*.

Iceland: It is the *largest volcanic island* located in the North Atlantic Ocean.

Do you know the difference between Britain and the United Kingdom?

- *Great Britain (Britain) → Island consists of England + Scotland + Wales*
- *United Kingdom (UK) → Political country consists of England + Scotland + Wales + Northern Ireland*
- *So, the United Kingdom = Great Britain+ Northern Ireland.*

- *Switzerland and Austria* are landlocked countries.

Balkan Nations: It refers to the countries located on the Balkan Peninsula in southeastern Europe.

Mountain Ranges

Ural Mountain Ranges: It separates *Europe* and *Asia* and is an *old fold mountain range*.

Alps Mountain Range: The Alps are the *highest mountain range* in Europe and are *young fold mountains*.

Scandinavian Countries and Nordic Countries

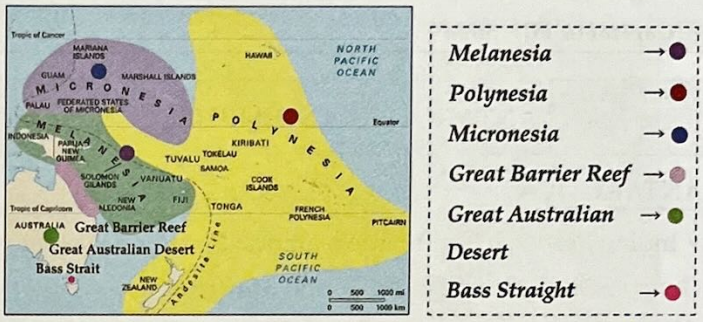
- Scandinavian countries: *Norway, Sweden, Denmark*
- Nordic countries: *Denmark, Finland, Sweden, Norway, Iceland*

Hidenburg Line: It is a line between *Germany* and *Poland* (*German defensive line* in French territory during *World War I*).

Some famous countries of Europe	*Capitals*
Norway (Land of Midnight Sun)	**Oslo**
Sweden	**Stockholm**
Finland	**Helsinki**
Denmark	**Copenhagen**
Germany	**Berlin**
Belgium	**Brussels**
Poland	**Warsaw**
France	**Paris**
Spain	**Madrid**
Portugal	**Lisbon**
Italy	**Rome**
Greece	**Athens (World's first Olympic games were held in 1896)**
Romania	**Bucharest**
Hungary	**Budapest**
Bulgaria	**Sofia**
Czech Republic	**Prague**
Austria	**Vienna**
Switzerland	**Bern**

Vatican City- *Smallest country* in the world.

OCEANIA



- Oceania is made up of *Micronesia, Polynesia, and Melanesia*, in addition to *Australasia*, which includes *Australia and New Zealand*.
- *Puncak Jaya* (also known as *Carstensz Pyramid*) is the *tallest mountain* in Oceania. (4884 m) (Located in Papua New Guinea).

Melanesia: Largest island in Melanesia: *New Guinea* (*capital - Port Moresby*).

- Papua New Guinea, Solomon Islands, Santa Cruz, Fiji - are parts of Melanesia. (*Capital of Fiji - Suva*).

Micronesia: *Marshall Islands* and *Kiribati* are parts of Micronesia.

Polynesia: Samoa, Tonga, Hawaii, Easter Island, Cook Islands and New Zealand are parts of Polynesia (Hawaii Islands are parts of the USA, while Easter island is part of Chile (South America).

Rivers

- The longest river of Australia is *Murray*.
- *Darling River* is Australia's other important river.

Straits

Bass Strait

- It separates *Tasmania* from *Victoria* in Australia.

Great Barrier Reef

- It is the world's *largest barrier reef* located in North Eastern coast of Australia.
- It is also the world's *largest coral reef system*.

Deserts

Great Australian Desert: The Great Australian Desert covers central and western *Australia*.

- It is made up of several interconnected deserts, making it the *largest in Australia*.
- Some major deserts are: *Victoria Desert, Great Sandy Desert, Tanami Desert, Simpson Desert, Gibson Desert.*

Islands

- *Stewart island* and *Cook islands* are parts of New Zealand.
- *King island* is part of Australia.

- **Capital of Australia-** *Canberra*
- **Capital of New Zealand-** *Wellington (located in North Island)*
- **Capital of Fiji-** *Suva*

ANTARCTICA AND ARCTIC

ANTARCTICA

- Indian Research Centre in Antarctica: *Bharati, Dakshin Gangotri (established in 1984),* and *Maitri*.

ARCTIC

- India's *first research centre "Himadri"*, located at *Spitsbergen, Svalbard, Norway*, was established here in *2008*.

Highest peaks of all Seven Continents

Mt. Everest (8848 m) - **Asia**
Mt. Aconcagua (6960 m) - **South America**
Mt. Denali/ McKinley (6190 m) - **North America**
Mt. Kilimanjaro (5895 m) - **Africa**
Mt. Elbrus (5642 m) - **Europe**
Mt. Vinson Massif (4892 m) - **Antarctica**
Mt. Kosciuszko (2228 m) - **Australia**

Decreasing order in height ↓

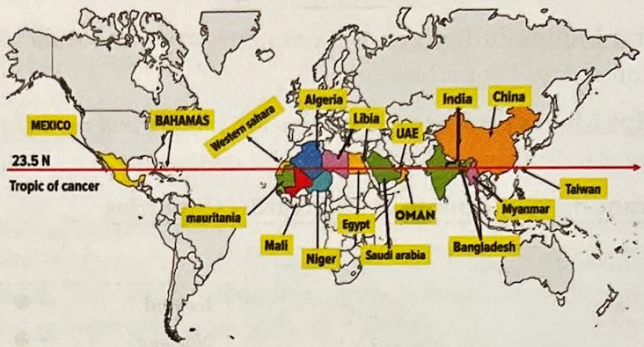
CITIES LOCATED ON BANKS OF RIVER

River	*Cities*
Seine river	Paris
Thames river	London
Tigris river	Baghdad
Danube river	Budapest
Nile river	Cairo
Ravi river	Lahore
Moskva river	Moscow
St. Lawrence river	Montreal/Quebec

COUNTRIES LOCATED ALONG THE TROPICS

Countries through which Tropic of Cancer Passes:

1. Mexico
2. Bahamas
3. Western Sahara
4. Mauritania
5. Mali
6. Algeria
7. Nigeria
8. Libya
9. Egypt
10. Saudi Arabia
11. UAE
12. Oman
13. India
14. Bangladesh
15. Myanmar
16. China
17. Taiwan

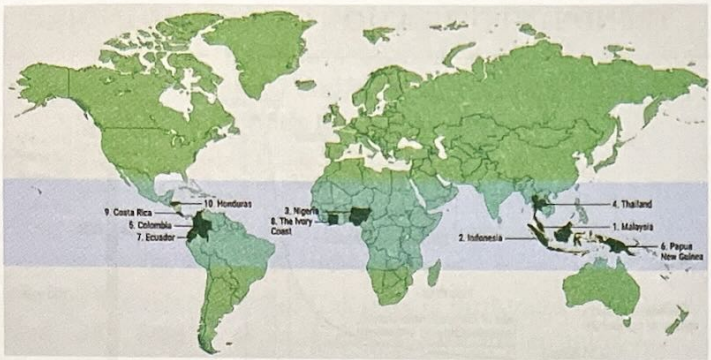


Countries through which Equator Passes:

1. Colombia
2. Ecuador
3. Brazil
4. Sao tome and Principe
5. Republic of Congo
6. Gabon
7. DRC Congo
8. Uganda
9. Kenya
10. Somalia
11. Maldives
12. Indonesia
13. Kiribati

Countries through which Tropic of Capricorn Passes:

1. Chile
2. Argentina
3. Paraguay
4. Brazil
5. Namibia
6. Botswana
7. South Africa
8. Mozambique
9. Madagascar
10. Australia



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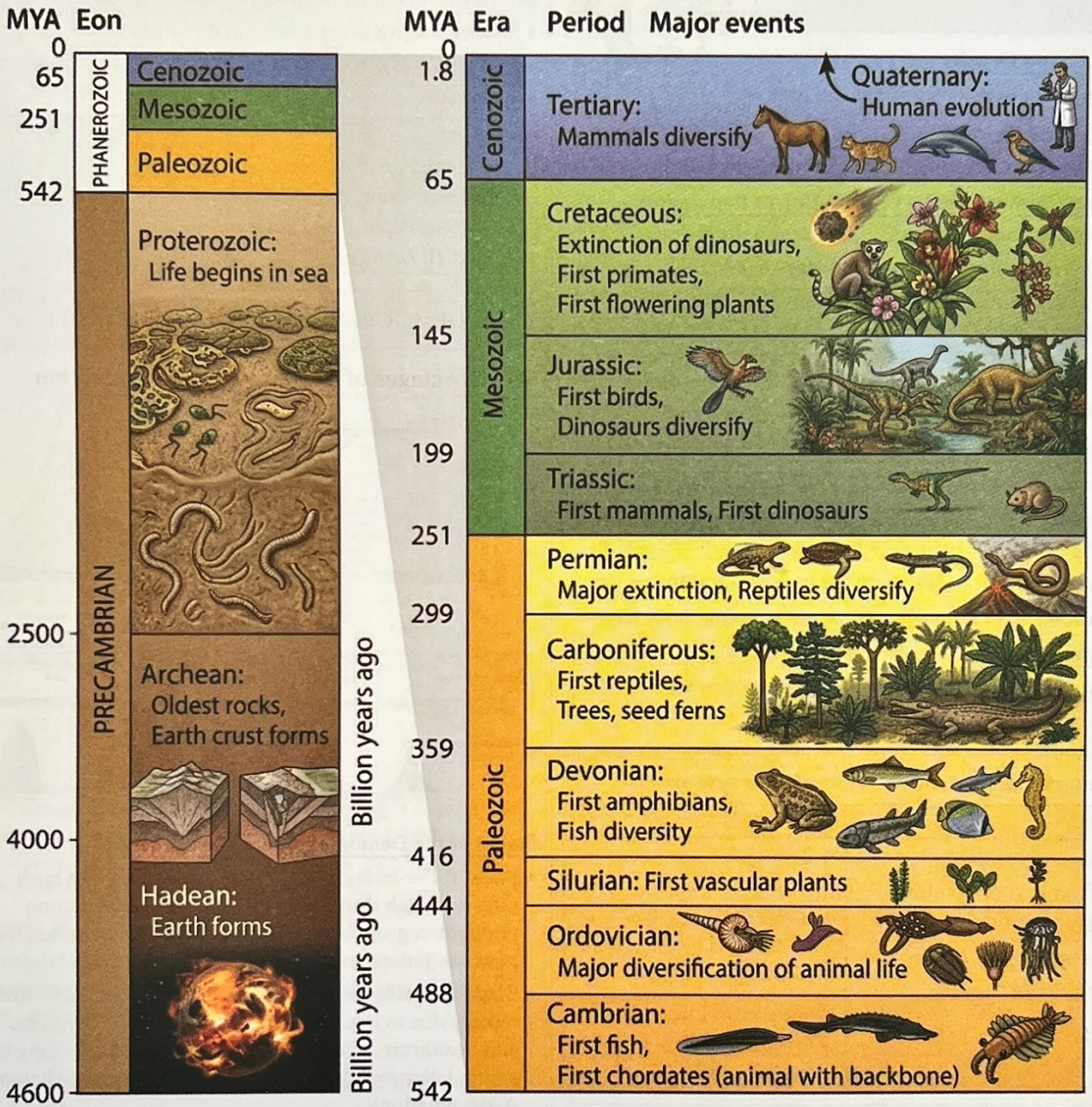
Geographical Timescale

SuperEon → Eon → Era → Period → Epoch



POPULATION DISTRIBUTION

Pattern:

The top 10 most populous countries of the world contribute about 60% of the world's population in which 6 are located in Asia.

- **They are:**

1. India: 17.78%
2. China: 17.20%
3. Indonesia: 3.47%
4. Pakistan: 2.90%
5. Bangladesh: 2.10%
6. Russia: 1.80%

Worldwide Five most Populous Countries are:

1. India
2. China
3. USA
4. Indonesia
5. Pakistan

Population Density

Population density = Population/Area

Physiological Density

Physiological Density = Population/Arable Land

Factors Influencing the Distribution of Population

1. Geographical Factors

(a) Availability Of Water
(b) Landforms
(c) Climate
(d) Soil

2. Economic Factors

(a) Minerals
(b) Urbanisation
(c) Industrialisation

3. Social and Cultural Factors

Components of Population Change

1. Birth
2. Death
3. Migration

India's crude birth rate (CBR) has declined from 19.1 in 2022 to 18.4 in 2023, according to data from the Sample Registration System.

- **Crude Birth Rate** = Live Birth/ Population X 1000
- **Crude Death Rate** = No. of Deaths/ Population X 1000

Migration:

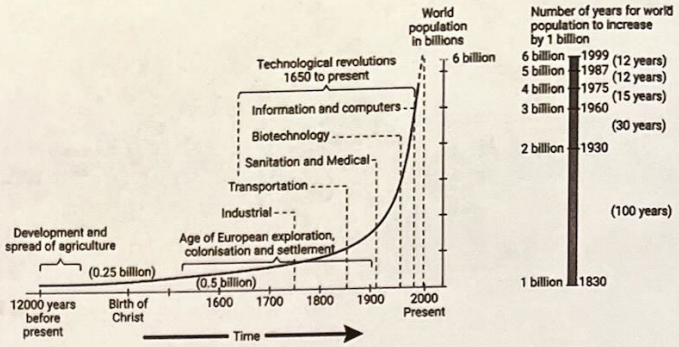
Movement of people from one place to another with the intention of settling there (permanently or for a long period).

Emigration: Migrants who move out of a place.

Immigration: Migrants who move into a new place.

Push Factors	*Pull Factors*
• Unemployment, • Poor Living Condition, • Political Turmoil, • Unpleasant Climate, • Natural Disasters, • Epidemics, • Socioeconomic Backwardness.	• Better Job Opportunities, • Better Living Conditions, • Peace and Stability, • Security of Life and Prosperity, • Pleasant Climate.

TRENDS IN POPULATION GROWTH IN INDIA



- The first stage has a high Birth Rate and Death Rate because people reproduce more to Compensate for the deaths due to epidemics and variable food supply.
- 200 years ago the world was in this stage.
- In the last stage both fertility and mortality decline considerably.

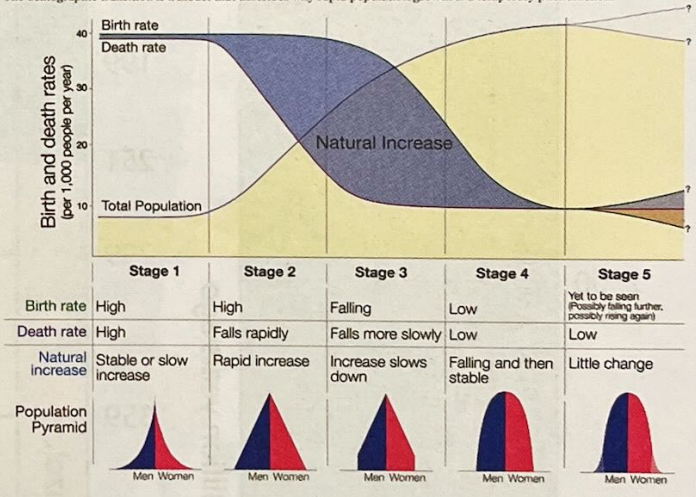
In India

- **1901-1921:** ***Period of Stagnant Population***
- **1921-1952:** ***Steady Population Growth***
- **1951-1981:** ***Population Explosion***
- **1981-2011:** ***High growth but signs of slowing down***

DEMOGRAPHIC TRANSITION MODEL

The five stages of the demographic transition

The demographic transition is a model that describes why rapid population growth is a temporary phenomenon.



	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Birth rate	High	High	Falling	Low	Yet to be seen (Possibly falling further, possibly rising again)
Death rate	High	Falls rapidly	Falls more slowly	Low	Low
Natural increase	Stable or slow increase	Rapid increase	Increase slows down	Falling and then stable	Little change
Population Pyramid	Men Women	Men Women	Men Women	Men Women	Men Women

Stages of the Demographic Transition Model

- **Stage 1:** ***Pre-Industrial (High Stationary):*** High birth rates and high death rates result in slow, fluctuating population growth. High mortality is due to limited food, poor sanitation, and disease.
- **Stage 2:** ***Developing (Early Expanding):*** Death rates drop rapidly due to improvements in food supply, hygiene, and healthcare, while birth rates remain high, leading to a population explosion. **Eg. include many sub-Saharan African nations.**

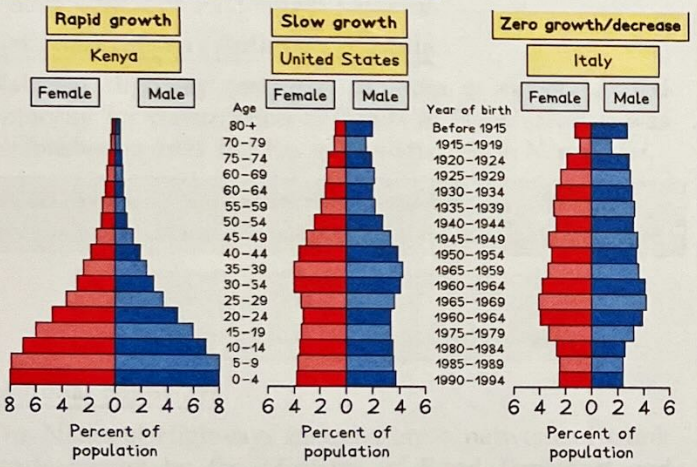
- **Stage 3:** *Industrializing (Late Expanding):* Birth rates begin to decline due to urbanization, increased education (especially for women), and better access to contraception. Population growth starts to slow. **Eg. India.**
- **Stage 4:** *Developed (Low Stationary):* Both birth and death rates are low, stabilizing the population. Improved living standards and smaller family sizes are common. **Eg. the USA and UK.**
- **Stage 5:** *Post-Industrial (Declining):* Birth rates fall below death rates, leading to a natural decrease and an aging population. **Eg. Japan, Germany, and Italy.**

Population Control Measures:

- Access to Family Planning Services
- Free availability of contraceptives

National Family Planning Programme: The National Family Planning Programme was launched in 1952 in India during the 4th Five Year Plan, making it the world's first national program of its kind. Its initial focus was on reducing birth rates to stabilize population growth.

Three Shapes of Population Pyramid



Wide base, narrow top ↓ high birth rate, youthful population.	More rectangular ↓ balanced age distribution	Narrow base, wider top ↓ low birth rate, aging population

Age Sex Pyramid:

- An age-sex pyramid is primarily known as a population pyramid or an age structure diagram. It is a graphical illustration that shows the distribution of various age for each gender in a specific population.

Thomas Malthus Theory:

Thomas Malthus's theory states that population grows at a geometric rate (multiplying) while the food supply grows at an arithmetic rate (adding).

OR,

The number of people would increase faster than the food supply.

Any further increase would result in a population crash caused by famine, disease and war.

Population Composition:

- **Working Population (Demographic Dividend):** *Age 15-59 Yrs.*

SETTLEMENTS

Types of Settlements:

1. Urban Settlement:

- **Towns:** Urban settlements with a population of *less than 100,000.*
- **Cities:** Urban settlements with a population between *100,000 and 1 million.*
- **Metropolitan Cities:** Urban settlements with a population between *1 million and 10 million.*
- **Mega Cities:** Cities with a population exceeding *10 million.*
- **Census Towns:** Settlements that exhibit urban characteristics (like having a population of 5,000 or more) but are not governed by a statutory local body like a municipality; they are governed by rural administrative structures.

2. Rural settlements:

- **Compact/Clustered/Nucleated:** Houses are built closely together in a cluster.
- **Semi-compact/Semi-clustered/Fragmented:** A cluster of houses that may be divided into several sub-clusters.
- **Hamleted:** Consists of one or more hamlets scattered over a wider area, often at a distance from the main village.
- **Dispersed:** Houses are widely separated from one another.

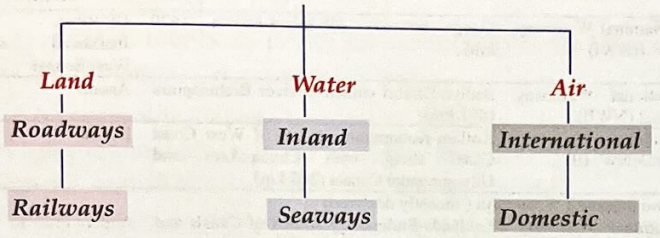
Types of Class Town:

Category	Type of Town/City	Population Range	Example
Class I	Large City	1,00,000 and above	Jaipur, Lucknow, Coimbatore
Class II	Medium Town	50,000 - 99,999	Saharanpur Bhilai, Siliguri
Class III	Small Town	20,000 - 49,999	Satna, Ambikapur, Bhiwadi
Class IV	Very Small Town	10,000 - 19,999	Lonavala, Hoshiarpur (earlier stages)
Class V	Semi-Urban Area	5,000 - 9,999	Tirur, Balurghat (smaller urban centres)
Class VI	Transitional Settlements	Less than 5,000	Emerging urban villages

The Census of India (under the Ministry of Home Affairs) defines urban areas for demographic and statistical purposes, while the Ministry of Housing and Urban Affairs (MoHUA) is responsible for urban planning, governance, and policy implementation.

This system helps in Urban planning, allocation of resources, and implementation of Government schemes.

MODES OF TRANSPORT



MODES OF TRANSPORT

Roadways

- India's road network is the *second largest* in the world.
- Total road network length : *66.71 lakh kilometres*

Detailed Breakdown:

- Total National Highway Length: *1,46,145 km*.
- State Highways: *1,79,535 km*.
- Expressways: *5,579 km* (as of July 2023).
- Highest road density : *Kerala*
- Lowest road density : *Arunachal Pradesh*
- State with maximum road length : *Maharashtra*
- State with least road length : *Sikkim*

National Highway Authority of India

National Highway Authority of India is the designated authority for construction of Roads in Plane areas. It was established in *1995* and has its headquarter in *New Delhi*.

Public Works Department(PwD) established in 1854 works for the maintenance of roads at the district and village level.

Motor Vehicle Act: 1988.
National Highway Authority Act: 1988.

National Highways

The National Highways in India are a network of trunk roads owned by the *Ministry of Road Transport and Highways (MoRTH)*.

- **Longest National Highway:** *NH 44 (4112 Km)*.

It connects *Srinagar to Kanyakumari* and was earlier known as *NH 7*.

- **Shortest National Highway:** *NH 548 & NH 118 (5Km)*

The historically important Sher Shah Suri Marg is known as National Highway 1. It links Delhi and Amritsar.

Bharatmala Pariyojana:

The Bharatmala Pariyojana was launched with the primary focus on optimizing the efficiency of the movement of goods and people across the country.

- *Phase I*-approved in October 2017, focuses on *development of National Highways.*

Note: *The Sagarmala Project*, launched in 2015, is related to the development of ports.

- *Bhupen Hazarika Bridge* is the **longest** bridge constructed over Lohit river and connects Assam to Arunachal Pradesh.

The Golden Quadrilateral (GQ)

- *The Golden Quadrilateral(GQ)* project initiated in *1999*, is a national highway network connecting most of the major industrial, agricultural and cultural centres of India.
- It forms a quadrilateral connecting the *four* major metro cities of India, viz., *Delhi (north), Kolkata (east), Mumbai (west) and Chennai (south)*.

Delhi-Kolkata: NH19 (erstwhile NH2)
Kolkata-Mumbai: NH46 (erstwhile NH6)
Mumbai-Chennai: NH48 (erstwhile NH4)
Delhi-Mumbai: NH48 (erstwhile NH8)

- It is a system of highways that spans a total length of **5,846 Km** (3,633 miles).

North-South-East-West Corridor

The North-South and East-West Corridor is a network of national highways connecting major cities of India. It consists of *two highway systems* - the North-South highway extending 4,000 km from Srinagar in the north to Kanyakumari in the south with a spur to Kochi and the East-West highway extending 3,300 from Silchar in the east to Porbandar in the west.

- *Jhansi* is the *junction* of North-South and East-West Corridors.

Border Roads

The Border Roads Organisation (Ministry of Defence), established in *1960*, aims to boost economic development and defense preparedness by improving road infrastructure in northern and *northeastern* border areas.

Railways

Significant facts about Indian railway network:

- Indian Railways is the *4th largest* railway network in the world.
- **Dibrugarh(Assam) to Kanyakumari(Tamil Nadu)** is the *longest train route* in India & Vivek Express runs on this route.
- **Uttar Pradesh** has the *longest route of Railway Lines in India* while Rajasthan is at *2nd* Place.
- **Longest Rail Bridge:** *Bogibeel Bridge (4.94 Km);* constructed on the Brahmaputra river - connects Dhemaji & Dibrugarh
- **Highest Rail Bridge:** *Chenab Bridge* (359m)
- **Longest Railway Station:** *Hubballi* (Karnataka) {1.5 Km}
- **2nd Longest:** *Gorakhpur*

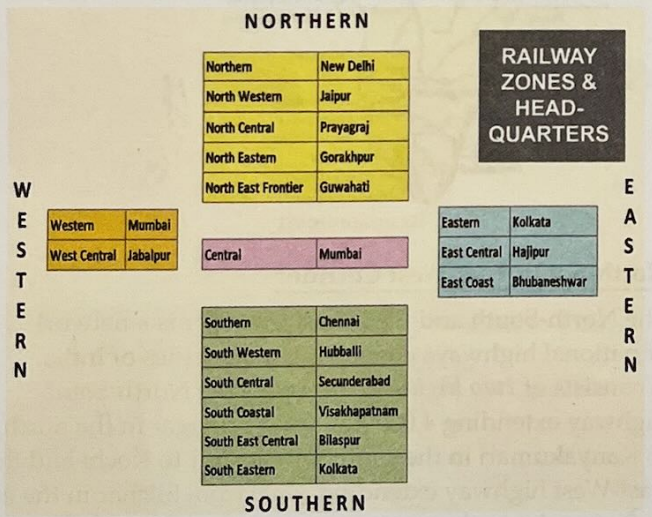
In India Railway Coaches are Manufactured in following places :

— Chittaranjan Locomotive Works : *West Bengal*
— Integral Coach Factory : *Perambur (Chennai)*
— Rail Spring Karkhana : *Gwalior*
— Rail Coach Factory : *Kapurthala (Punjab)*
— Diesel locomotive Works : *Varanasi*
— Wheel and Axle Plant : *Bengaluru*

1st train in India :
— Introduced by Dalhousie.
— ran from Mumbai to Thane on 16 April 1853.

- **There are total *18* railway zones.**

Railway zones and their headquarters



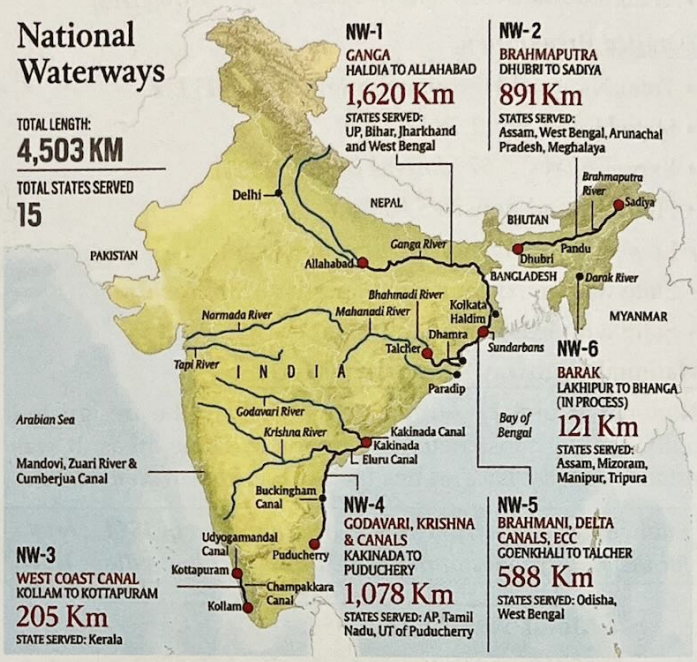
WATER TRANSPORT

Nearly *90%* of India's trade Volume (in terms of value), is moved by sea making shipping, the backbone of trade and economic growth.

1st Under Water Metro : Kolkata
Metro Man of India : E. Sreedharan

National Waterways

Series Number	Name and Stretch	Geographic Extent
*National Waterway No.1(NWI)	Ganga between Allahabad-Haldia (1620 km)	UP,Bihar, Jharkhand and West Bengal
National Waterway No.2 (NWII)	Sadiya-Dhubri stretch of river Brahmaputra (891 km)	Assam
National Waterway No.3(NW: III)	Kollam-Kottapuram stretch of West Coast Canal along with Champakara and Udyogmandal Canals (205 km)	Kerala.
Two proposed Waterways (recently declared)		
National Waterway No.4(NWIV)	Kakinada-Puducherry stretch of Canals and the Kaluvelly Tank, Bhadrachalam - Rajahmundry stretch of River Godavari and Wazirabad - Vijayawada stretch of River Krishna (1095 km)	Andhra Pradesh
National Waterway No. 5(NWV)	The Talcher-Dhamra stretch of river Brahmani, Geonkhali-Charbatia stretch of East Coast Canal, Charbatia-Dhamra stretch of Matai river and Mangalgadi-Paradip stretch of Mahanadi delta rivers (623 km).	Dhamra, Orrissa



***To read more in detail about National Waterways, please refer to the 'Ports' sections*

Inland Waterways Authority of India (IWAI),

IWAI, established in *1986* under the *Ministry of Ports, Shipping and Waterways*, is responsible for the development, maintenance, and regulation of inland waterways for shipping and navigation in India. It has its headquarters in *Noida, Uttar Pradesh*.

AIR TRANSPORT

- **Air services in India started in:** *1911*
- **State with Most no. of International Airports:** *Uttar Pradesh* (Kerala stands at **2nd** Place)
- **Largest Airport:** *Indira Gandhi International Airport, IGIA (New Delhi)*

Recently in February 2025, IGAI became the first Indian airport to run entirely on solar and hydro power.

- **Smallest Airport:** *Baljek AirPort (Meghalaya)*

• **Oldest AirPort:** *Juhu Aerodrome in Bombay* (established in 1928)

Airports Authority of India (AAI)

AAI is a **statutory** body under the ownership of the Ministry of Civil Aviation, Government of India.

• AAI currently manages a total of *137 airports*, including 34 international airports, 10 Customs Airports, 81 domestic airports, and 23 Civil enclaves at Defense airfields.

• It was established in *1995* and has its Headquarters in *New Delhi*.

Greenfield Airports: Airports that are built from scratch in a previously undeveloped land.
Brownfield Airports: These are existing airports that are upgraded, modernized, or expanded rather than built from scratch.

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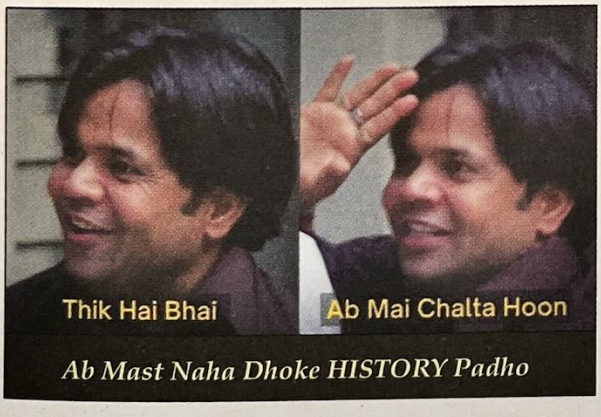

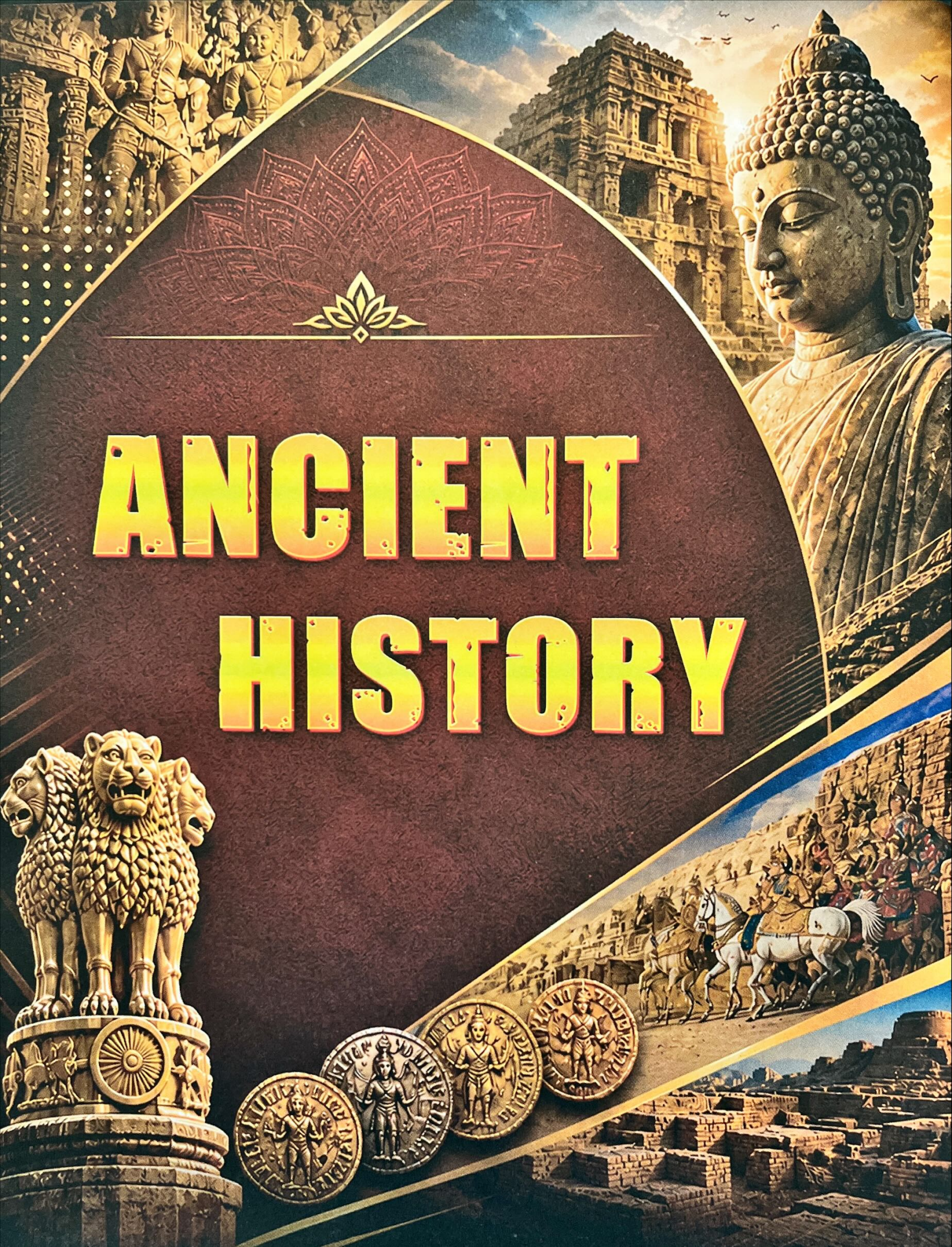
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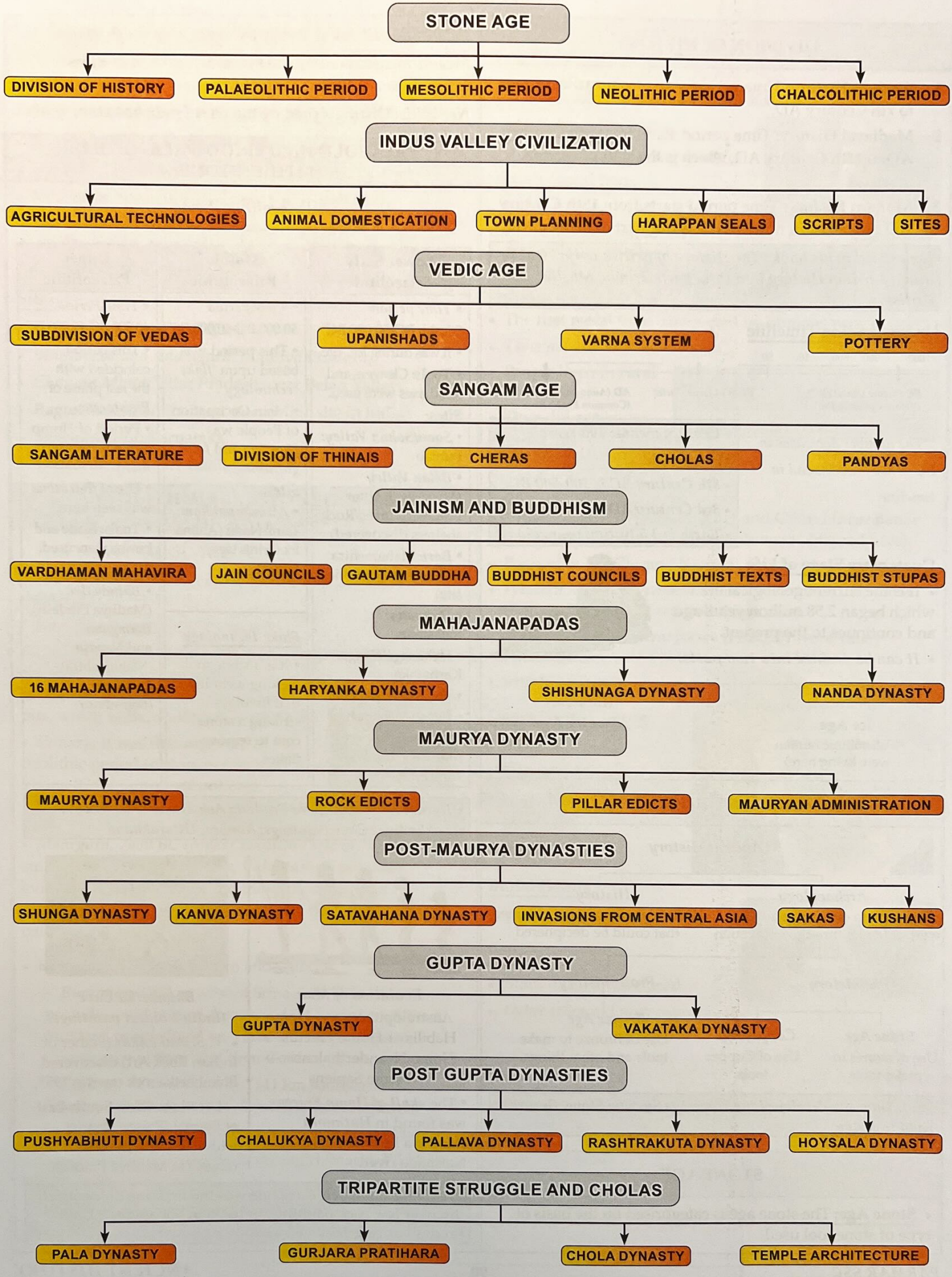
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PALAEOLITHIC PERIOD
MESOLITHIC PERIOD
NEOLITHIC PERIOD
CHALCOLITHIC PERIOD
INDUS VALLEY CIVILIZATION
AGRICULTURAL TECHNOLOGIES
ANIMAL DOMESTICATION
TOWN PLANNING
HARAPPAN SEALS
SCRIPTS
SITES
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VARNA SYSTEM
POTTERY
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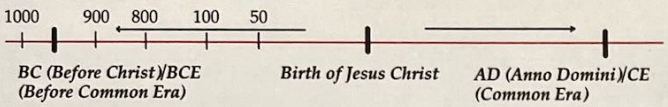
SHISHUNAGA DYNASTY
NANDA DYNASTY
MAURYA DYNASTY
MAURYA DYNASTY
ROCK EDICTS
PILLAR EDICTS
MAURYAN ADMINISTRATION
POST-MAURYA DYNASTIES
SHUNGA DYNASTY
KANVA DYNASTY
SATAVAHANA DYNASTY
INVASIONS FROM CENTRAL ASIA
SAKAS
KUSHANS
GUPTA DYNASTY
GUPTA DYNASTY
VAKATAKA DYNASTY
POST GUPTA DYNASTIES
PUSHYABHUTI DYNASTY
CHALUKYA DYNASTY
PALLAVA DYNASTY
RASHTRAKUTA DYNASTY
HOYSALA DYNASTY
TRIPARTITE STRUGGLE AND CHOLAS
PALA DYNASTY
GURJARA PRATIHARA
CHOLA DYNASTY
TEMPLE ARCHITECTURE

DIVISION OF HISTORY

1. **Ancient History:** Time period starts from **earliest times** to 7th Century AD.
2. **Medieval History:** Time period starts from **8th Century AD to 18th Century** AD, which is the start of Islamic invasion.
3. **Modern History:** Time period starts from **18th Century AD onwards** till now, which is the start of British Rule.

James Mill in his book "The History of British India" (1817), divided Indian History into three parts: Hindu, Muslim and British.

Understanding Timeline



****The number decreases in BC as we move ahead in timeline.**

- *Century means: 100 Years*

For example

- *8th Century BC is 700-800 BC*
- *3rd Century AD is: 200-300 AD*
- *Earth is 4.5 Billion years old*

Quaternary Stage of Life

- It is the current geological era which began 2.58 million years ago and continues to the present.
- ***It can be divided into two parts:***

Pleistocene	*Holocene*
Ice Age (Palaeolithic human were living here)	**After Ice Age**

ANCIENT HISTORY

- ***Ancient History***
  - ***Archaeology*** — No written evidence and they were obtained through excavation
  - ***History*** — Written evidence were obtained that could be deciphered
    - ***Pre-history***
      - ***Stone Age*** — Use of stones to make tools
      - ***Copper Age*** — Use of Copper tools
    - ***Proto-history***
      - ***Bronze Age*** — Use of Bronze to make tools and other things.

C. J. Thomson developed the Three Age System: Stone, Bronze, and Iron Age.

STONE AGE

- **Stone Age:** The stone age is categorised on the basis of type of stone tool used.

Palaeolithic: Characterized by the use of *large, rough stone tools.*

Mesolithic: Marked by the introduction of microliths (micro = *small*; lith = *stone*).

Neolithic: Distinguished by the use of *polished stone tools.*

PALAEOLITHIC PERIOD (PALAEO: OLD; LITHIC: STONE)

Palaeolithic Period

Lower/Early Palaeolithic

- *Time period* 5 Lakh BC-50,000 BC
- It was during Ice Age.
- **Tools:** Cleavers and hand axes were used.

Sites:

- ***Soan/Sohan Valley:*** Punjab
- ***Belan Valley (Mirzapur):*** Uttar Pradesh (Caves/Rock shelters discovered)
- ***Bori:*** Maharashtra (Earliest palaeolithic site)
- ***Didwana:*** Rajasthan
- ***Hunasagi/Hungsi:*** Karnataka
- ***Pahalgam:*** Kashmir
- ***Patne:*** Maharashtra

(Ostrich evidence found for the first time here)

Middle Palaeolithic

- *Time period* 50,000 BC-40,000 BC
- This period was based upon *'flake technology'.*
- Main Occupation of People was *Hunting* and *food gathering.*

Sites:

- ***Attirampakkam*** Tamil Nadu (Animal footprints were found)

Flake Technology

- It is a stone tool-making technique that involves striking a stone core to remove flakes.

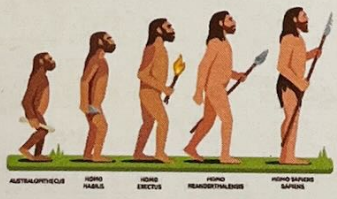
Upper Palaeolithic

- *Time Period* 40,000 BC-10,000 BC
- This period coincided with the last phase of *Pleistocene.*
- Period of Homo Sapiens (modern man)
- Use of *flint stone* was seen here.
- **Tools:** Blade and burins were used.

Sites:

- ***Bhimbetka*** (Madhya Pradesh), ***Inamgaon*** and ***Nevasa*** (Maharashtra), ***Didwana*** (Rajasthan)

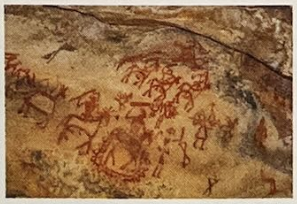
- ***Kurnool Caves, Andhra Pradesh: Ash Traces were discovered***
- ***Lakhudiyar Cave Paintings: Almora, Uttarakhand***



Evolution of Man

Australopithecus → Homo Habilis → Homo Erectus → Homo Neanderthalensis → Homo Sapiens

- The *skull of Homo Erectus* was found in *Hathnora* (Madhya Pradesh) near Narmada river.



Bhimbetka Cave (India's oldest paintings)

- *V. S. Wakankar* (Father of Indian Rock Art) discovered Bhimbhetka rock caves in *1957.*
- **Location: 40km South-East** of Bhopal (Raisen District within the Vindhyachal ranges) in Madhya Pradesh.

Archibald Campbell Carlleyle was the first one to identify/ discover few rock paintings in India in Sohagighat, Uttar Pradesh during 1867-68.

MESOLITHIC PERIOD (MESO: MIDDLE; LITHIC: STONE

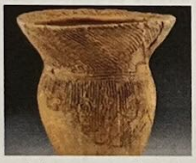
- It is also known as Microlithic.
- *Time period:* 9000 BC- 7000 BC *(12,000 BC-10,000 BC, SSC)*
- Transitional phase between *Palaeolithic and Neolithic.*
- Warmer climate increased flora and fauna.
- Mesolithic humans were *hunters* and *gatherers*.
- The *earliest Mesolithic* evidence of *animal domestication* in India is found at *Bagor* in Rajasthan and *Adamgarh* in Madhya Pradesh.

Sites

- ***Langhnaj:*** Mehsana, Gujarat
- ***Bhimbetka and Adamgarh:*** Madhya Pradesh.
- ***Chopani Mand:*** Uttar Pradesh; near Belan Valley.
- ***Bagor:*** Rajasthan (Largest microlithic site in India)
- ***Sanganakallu:*** Karnataka.
- ***Tuticorin:*** Southern Tamil Nadu.

NEOLITHIC PERIOD (NEO: NEW; LITHIC: STONES)

- *Time period:* 7000 BC-1000 BC
- *Art:* Bhimbetka (Rock paintings of humans, birds, animals).
- Neolithic People *owned property*.
- Late Neolithic settlers were *agriculturists* who lived in circular (communal property) and rectangular (individual property) houses made of mud and pits, which is archaeologically attested.
- *Pottery:* It was first invented in the neolithic period to store excess food grains *(Cord impressed pottery)*.



Cord impressed pottery

Sites

- ***Mehrgarh, 7000 BC*** (*oldest neolithic site* of Indian subcontinent in *Balochistan, Pakistan*): It provides evidence of early houses and the earliest traces of agriculture, with crops such as wheat, barley, and cotton cultivated here.
- ***Kashmir Valley:*** Burzahom and Gufkral
  - ***Burzahom*** (16 km west of Srinagar): This site provides evidence of *domestic dogs buried with their Masters,* people lived on a lake side in pits, use of Coarse grey pottery and *Bone Tools*.
  - ***Gufkral:*** *"Cave of potters"* (41 km southeast of Srinagar); agriculture and domestication of animals.
- ***Bihar:*** Chirand (*tools made of bones* were found here).
- ***Karnataka:*** Sanganakallu, Brahmagiri, Maski, Piklihal, Hallur *(millet cultivation)*.
- ***Andhra Pradesh:*** Around Bhima, Krishna, Tungabhadra river. Budihal, Utnur (earliest site), Nagarjunakonda.
- ***Belan Valley (UP):*** Koldihwa and Mahagara *(Earliest evidence of rice cultivation; 7000 BC)*.
- ***Tamil Nadu:*** Paiyampalli and Kaveri.
- ***Meghalaya:*** Garo Hills.
- ***Assam:*** Daojali Hading (*Jadeite stone* found here).
- ***Catal Huyuk:*** Türkiye (One of the first human protocities).

Celt

Jadeite stone

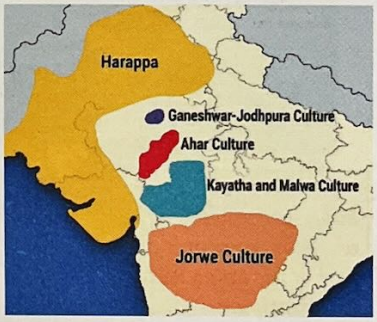
CHALCOLITHIC PERIOD (CHALCO: COPPER; LITHIC: STONE)

- The first metal to be discovered by humans was: *Copper*.
- *Time period:* 3500 BC-1000 BC.
- People lived in rural communities.
- They did not know about horses and burnt bricks.

Copper Mines
1. Khetri Mines (Rajasthan).
2. Malanjkhand (Madhya Pradesh).

Sites

- ***South Eastern Rajasthan:*** Ahar and Gilund (near Banas Valley), Ganeshwar (Copper tools were obtained here).
- ***Eastern India:*** Chirand (Ganga), Burdwan, Midnapore.
- ***Western Madhya Pradesh:*** Malwa (Narmada), Kayatha (Kalisindh), Eran, Navdatoli (Narmada).
- ***Western Maharashtra:*** Jorwe (First), Pravara valley (Godavari).
- Savalda (Tapti).



Under Jorwe Culture

- Nevasa
- Daimabad *(Largest site)*
- Chandoli
- Inamgaon
- Nasik

Burial Habits

- They practised *"Urn"* burial.

Pottery

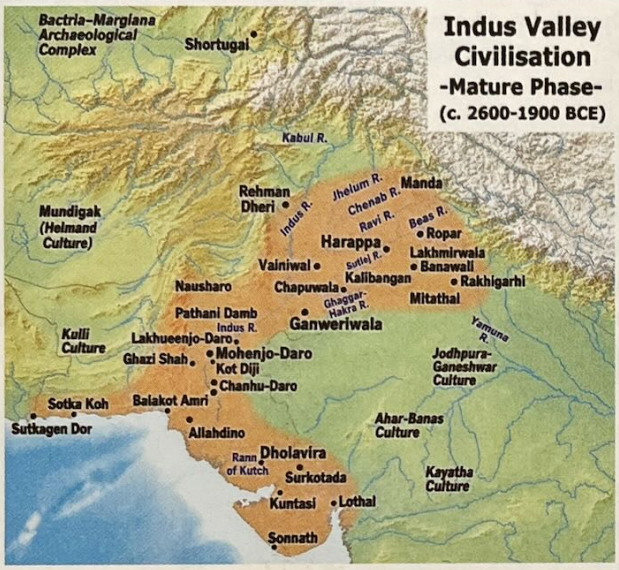
- *Black and red* ware used.
- *Ochre* coloured potteries were used.

INDUS VALLEY CIVILIZATION

Indus Valley Civilization (IVC)/Harappan Civilization

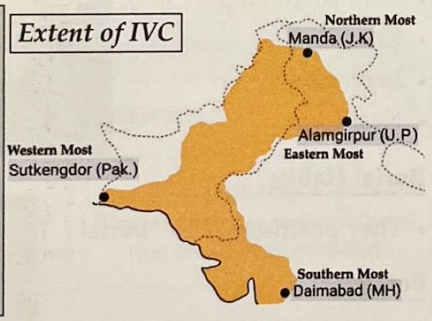
- Time Period: 2500-1750 BCE
- It is also known as *Bronze Age*.
- Named by: *John Marshall* {Director of *Archaeological Survey of India* (ASI)}.
- *Harappa* was the 1st site to be discovered in IVC in *1921* by *Dayaram Sahni* while *Mohenjodaro* was discovered in *1922* by *Rakhal Das Banerjee*.

> • *First Chairman of ASI: "Alexander Cunningham" (Father of Indian Archaeology).*
> • *Alexander Cunningham identified the location of the Ancient City of Taxila.*
> • *First female director of ASI: Debala Mitra.*



> • *The Cholistan region in present-day Pakistan was once a thriving part of the Indus Valley Civilization.*
> • *Most of the Mature Harappan sites in the region of Cholistan had been abandoned during 1800 BCE.*

Extent of IVC



Early Harappan Sites (3000-2600 BCE)	• Damb Sadaat • Amri Nal	• Kot Diji • Siswal
Mature Harappan Sites (2600-1900 BCE)	• Harappa • Lothal • Kalibangan • Banawali	• Mohenjodaro • Dholavira • Rakhigarhi • Ganeriwala
Late Harappan Sites (1900-1700 BCE)	• Jhukar • Amri • Desalpur • Ahar	• Mitathal • Rangpur • Lothal • Daimabad

Note: This chart is not much important for SSC exams.

> • *A shift in the course of the Hakra river system is a key factor marking the transition from Mature Harappan to Late Harappan phase.*
> • *Garden of IVC/Oasis of Sindh : Mohenjodaro*

Agriculture

- Major Crops: Wheat & Barley, Cotton, Lentil, Chickpea, Sesame, Millets, Rice (rare), Garlic.

> • *Cotton was one of the distinguishing feature of IVC.*
> • *Greeks used the name "Sindon" for cotton.*

Agricultural Technologies

- Ploughed field found at *Kalibangan (Rajasthan)*. Two sets of furrow were found at right angle suggesting two different crops were grown together.
- *Oxen* were used for *ploughing*.
- Terracotta model of plough found in *Cholistan* and *Banawali*.

Animal Domestication

- Cattle like sheep, goat, buffalo, pig, bull, ox were domesticated.

> • *Evidence of horse and cow are not found.*
> • *A bone of horse was discovered from Surkotada (Gujarat).*

- Bones of boar, gharial, deer, fish, and fowl were found, which indicates about their domestication.

Town Planning

- The most unique feature of Harappan Civilization was development of *Urban Centres*.
- Most Harappan sites were divided into two parts

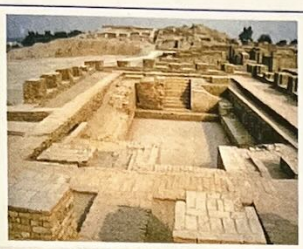
Two Parts

Citadel / Acropolis	*Lower Town*
• Smaller but *higher* town.	• Larger but *lower* town.
• Meant for special public purposes.	• Meant for residential buildings.

- Both Citadel and Lower Town were *Fortified* (walled) and *physically separated*.
- The *citadel* in Harappa was a fortified, elevated area (typically to the west) used for administrative, religious, and ceremonial functions. It served as a secure hub for the ruling class, featuring important buildings like granaries for storage, assembly halls, and structures for public baths, while protecting them from floods and enemies.

> **Exception:**
> • *Dholavira (Gujarat) was divided into three parts and Chanhudaro (Pakistan) had no Citadel.*
> • *The Citadel within Lothal was not surrounded by a fortification but instead was built on raised mud-brick platform.*

The Great Bath



- *Great Bath (at Mohenjo-daro)* is rectangle shaped tank like structure ***(12 m length, 7 m width and 2.4 m depth)***, which might have been used for ritual bathing.
- *Gypsum* based *Mortar* was used for waterproofing.

Great Granary

- It was the ***largest building*** in Mohenjodaro.
- It was used for *storage of grains*.

Brick granary of Harappa

- Total 12 granaries (6 granaries in each row)
- A circular bricks platform was found in harappa.

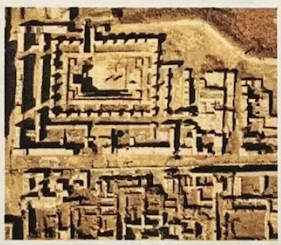
Drainage system of IVC

- Most distinctive feature of Harappa Civilization.
- *Sumps* or *Cesspits* were made between drains to clean and trap solid waste.

Domestic Architecture

The IVC was known for its advanced *urban planning* and well-structured houses and streets were made in grid pattern.

- The houses were made of *burnt bricks* (baked bricks).
- Bricks of *standardised ratio (1:2:4)* were used.
- *Little pots* of faience (a rare glazed material made from *ground silica*) were used primarily as *luxury containers* for precious substances like perfume or oil.
- *Saddle querns* were essential stone tools used for *grinding cereals* like wheat.
- Doors were made of wood.
- Every house had its own bathroom, many of them had their own *private wells* also.
- Grid pattern roads/streets, intersecting at *right angle (90°)*. **E.g.** *Lothal*.



Grid Pattern

- *Stone* was predominantly used for constructing the *foundations* of most of *Dholavira* site.
- *Limestone slabs* were used as drain covers.
- *Canal Traces* were found at *Shortugai*.

Tracking Social Differences

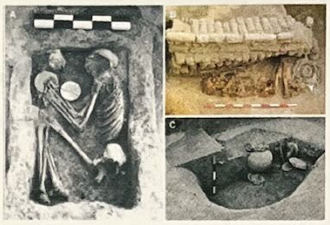
Burials Habits

- Some of the graves contain Potteries and ornaments as belief that it can be used in afterlife.

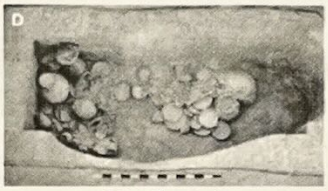
Ornaments, consisting of three shell rings, a Jasper Bead and hundred of micro beads, were found near the skull of a male at Harappa.

- Jewellery was found in burial of both men and women.
- The Dead were buried with *copper mirrors*.
- Harappans did ***not believe*** in burying precious things with the dead.
- Burial of dogs along with their masters (found in *Ropar, Punjab*).

Coffin burial excavated in Harappa



Harappans buried with ornaments and potteries



Urn burial

Double/Joint burial excavated from Lothal

Craft Production

Beads of diverse shapes, including cylindrical, circular (spherical), and barrel shaped, are hallmark artifacts of the IVC.

- *Chanhudaro:* Bead making, shell cutting, metal working, seal making, and weight making.

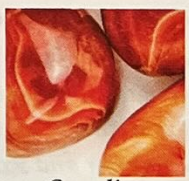
Ornaments from IVC

Jadeite stone

- *Nageshwar (Gujarat)* and *Balakot (Pakistan)*: They were centres for shell making (Bangles, Ladles, and Inlay).

Other Trade & Commerce Sites

- *Shortugai (Badakhshan mines, Afghanistan): Lapis Lazuli Stone*
- *South Rajasthan & North Gujarat: Steatite (soft stone)*
- *Gujarat (Ratnapur): Carnelian Stone*
- *Kolar (Karnataka): Gold*
- *Rajasthan and Magan (modern-day Oman): Copper*



Carnelian

Lapis Lazuli

- *Mesopotamia (cradle of Civilization) was the primary overseas trading partner of IVC people.*
- *In Mesopotamian writings, Meluhha refers to the IVC.*

Harappan seals

- Harappan seals were made of *steatite* (a type of soft stone).

The Harappans were not aware about lion.

- The Seals often contained *animal motifs* (Short Script) and a *pictographic script*.
- The seals usually have a line of writing probably containing the name and title of the owner.
- They knew about ships, as *ships* were portrayed in seals.

Script

- The Harappan writing system is commonly known as *Indus Script* which was written in *boustrophedon style* (Right to Left then left to right).
- The script is not in *alphabetical order* and is *pictographic*.
- Most inscriptions are short, the longest inscription contains about *26 signs.*
- They were found on jewellery, bone rods, seals, copper tools, jars, and an ancient signboard.
- The script is *undeciphered* till date.

Weights

- *Barter system* was prominent in IVC.
- The weights were *uniform.*

Weights were in Multiples of 16

- Exchange was regulated by a precise system of weights, usually made of a stone called *"Chert"*.
- ***Sukkur and Rohri hills:*** *Limestone* and *Chert blades* were mass produced and sent to various Harappan settlements in Sindh.
- ***Lower denomination of weights:*** were in *Binary system.*
- ***Higher denomination of weights:*** were in *Decimal system.*

Religious Practices

- They worshipped unusual or unfamiliar objects such as *Mother Goddess, Priest King, etc.*
- Fire altars at *Kalibangan* and *Lothal* indicate *fire worship*.

- *Lingas:* Conical shaped stone objects *worshipped* as symbol of *Shiva*.

Terracotta figure of a Mother Goddess (Found in Mohenjadaro) symbolises a Tree Growing out of Embryo

Priest King (17.5 cm/6.9 inches tall) made of steatite obtained from Mohenjodaro

Linga

Seals

- Unicorn: One Horned Animal.
- Proto Shiva seal (Pashupati).

***IVC people did not know about Iron but knew about gold.*

One horned animal (Unicorn)

Shiva in yogic posture (Pashupati seal)

The dancing girl statue (10.5 cm tall) made of bronze in Tribhanga Mudra

Pottery Used

- Hakra Pottery (Early Harappan phase)
- Ochre coloured pottery (Late Harappan phase).
- Black-Red ware pottery.

Possible Reasons for Decline of Harappan Civilization

- Climate Change
- Deforestation
- Excessive Floods
- Foreign invasion
- Shifting or Drying up of Rivers

Male Torso of the Harappan Civilization

Important Sites

Site	River	Characteristic Features
Harappa (1921) by *D. R. Sahni* in Punjab; Pakistan	Ravi	12 Granaries (6 granaries in a row) First IVC Site; Male Torso Sculpture (made from Red Stone) was found

Mohenjodaro (1922) by ***R. D. Banerjee*** in Sindh; Pakistan	Indus	Great Bath; Great Granary; protoshiva; Dancing girl statue; Goddess earth; Bearded man
Chanhudaro in Sindh	Indus	City without Citadel
Lothal in Gujarat by ***S. R. Rao***	Bhogava	Ancient port/ dockyard; Fire altar; Double burial
Kalibangan in Rajasthan	Ghaggar	Fire altars; black bangles; ploughed field; Two different crops were grown together.
Rakhigarhi in Haryana	Ghaggar	Largest IVC site; Terracotta wheel; Toys
Dholavira in Kutch area; Gujarat, discovered by ***J. P. Joshi*** and excavated by ***R. S. Bisht***		Giant water reservoir; City was divided into three parts; Dams and water harvesting and water management system India's 40th UNESCO site, added in 2021.
Banawali in Haryana by ***R. S. Bisht***		Barley; Lack of grid patterns; Terracotta model of plough; Toilet in a house
Bhirrana in Haryana		Oldest IVC site; the earliest radiocarbon dates for the IVC
Surkotada in Kutch, Gujarat by ***J.P. Joshi***		Fortified citadel; Evidence of horse remains were found
Ropar in Punjab	Sutlej	Pit burial
Sonauli in UP		Extended burial

VEDIC AGE

Vedic Age (1500-600 BC)

- *Early Vedic Age (1500-1000 BC)* → *They were pastoral community*
- *Later Vedic Age (1000-600 BC)*.

- *Boghazkoi Inscription (Türkiye)*: It mentions names such as Indra, Varun, etc.
- It is believed that *Aryans* arrived from Central Asia, where one group migrated from Turkey towards Europe and other came towards India.
- **Language of Aryans:** *Sanskrit*.
- The Aryans are credited with codifying the Vedas.

VEDAS

- The word Veda is derived from the *Sanskrit* root word *"Vid"*, which means *"to know"*.
- *There are four Vedas: Rigveda, Samveda, Yajurveda and Atharvaveda.*
- Oldest Text of Aryans is the *Avesta/Zend-Avesta (Iran).*

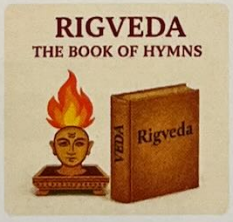
Only Rig Veda was compiled during Early Vedic Age, rest three Vedas were compiled in later vedic age.

- *Apaurusheya:* They are not created by *man but gifted by God.*
- They were orally passed *(Shruti)* from one generation to another.

Subdivisions of Vedas

Samhita	*Brahmanas*	*Aranyakas*	*Upanishads*
Collection of Hymns (Sukta)	Sacrifices and Rituals	Hermits (those who lived in jungles)	Bhakti (talks about Bhakti Marga)

Rig Veda

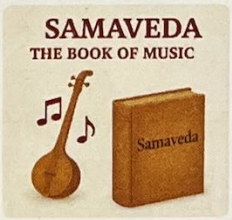


- It was the first Veda to be compiled.
- It has the *oldest* and *largest* collection of *Sanskrit hymns*.
- *Total: 1028* hymns and *10,600* Verses
- Hymns are recited by *Hotri*.
- *Sukta* were known as hymns in Rigveda.
- *Deities:* Indra (known as Purandar), Agni (God of Fire), Vishnu, Soma, and Varuna (God of Rita).
- *Female deities:* Aditi (Mother of Gods), Raka (goddess of prosperity), Sinivali (goddess of fertility) and Usha (goddess of dawn).
- The terms *nrti* (dance/dancer) and *nrtu* (danseuse/female dancer) are mentioned in the Rig Veda.
- The Rigveda mentioned the names of some learned ladies like *Ghosha, Apala* and *Viswavara*, who composed mantras and attained the rank of Rishis.
- In the Rig Veda Samhita, use of the terms *Ishukrit* and *Isukara* referred to the maker of Arrows.
- *Somras* is an *energy drink*.
- It is made up of *10 mandalas* and mandala no. *2-7* were created first.
- *Gayatri Mantra* was written by *Sage Vishwamitra* for *Goddess Savitri* (mentioned in *3rd mandala*).
- *9th mandala* mentions: *Lord Soma (Lord of Plants).*
- *10th Mandala* mentions about the hymn of *Purusha Shukta*.

- **Mouth: Brahmans**
- **Arms: Kshatriya**
- **Thighs: Vaishya**
- **Feet: Shudra**

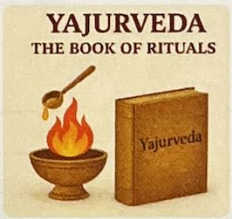
} These four varnas are believed to have emerged from different parts of Purusha (Cosmic being).

Sama Veda



- It is the oldest book on *music*.
- It consists of chanting melodies.
- The *Udgatri* (or Udgatr) sings the saman (melodies) to *invoke gods*.
- Samveda is traditionally paired with an *Upaveda* known as *Gandharvaveda*.
- It is composed of two Upanishads; *Chandogya* and *Kena*.

Yajur Veda



- It is the collection of *mantras* (rituals and sacrifices).
- It is divided into two section; *Shukla* (meaning: *White or Pure,* focused on mantras only, and *Krishna* (meaning: *Black/Mixed i.e.* Mantra & Explanation).
- The Brahmana text related to Yajurveda: *Taittiriya* (Black) and *Shatapatha Brahmana* (largest).
- The *Adhvaryu* are the reciters of the Yajurveda who perform the action-oriented rituals.

Vedamurti Devavrat Mahesh Rekhe, a 19-year-old Vedic scholar from Maharashtra, indeed completed the Dandakrama Parayanam — a rare recitation of about 2,000 mantras from the Shukla Yajurveda's Madhyandina branch — over 50 consecutive days in Varanasi.

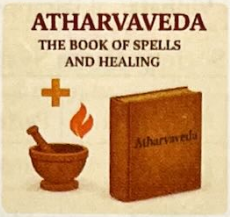
Important Upanishads of Yajur Veda

- *Brihadaranyaka Upanishad* (oldest Upnishad): A key text of the Shukla Yajurveda; mentioned *Gargi Vachaknavi* (a renowned female sage).
- *Katha Upanishad (Kathopanishad)* {contains story of *Nachiketa* and *Yama* (God of *Death*)}.
- *Jabala Upanishad* is a part of *Shukla Yajurveda*.

Ashrams Mentioned in Jabala Upanishad

1st Phase	Brahmacharya	Learning and disciplined life
2nd Phase	Grihasta	Householder Life
3rd Phase	Vanaprastha	Hermit/Retirement Life
4th Phase	Sanyasa	Renunciation

Atharva Veda



- It is divided into *20 khandas*.
- Veda of magic formulas to ward off *evil spirits* and *diseases* (black magic).
- Performed by Brahman priest.
- *Gopatha Brahmana* is the only surviving Brahmana (prose commentary) text exclusively associated with the Atharvaveda.

Important Upanishads of Atharva Veda

- ***Mundaka Upanishad:*** *Satyameva Jayate* taken from here.
- ***Maha Upanishad:*** *Vasudhaiva Kutumbkham* (meaning: *"the whole world is one family"*) taken from *Chapter 6* of *Maha Upanishad*.
- *Mundaka* Upanishad is *longer* than Mandukya Upanishad.

Schools of Philosophy	*Propounded By*
Samkhya (Analysis/Dualism): Oldest	Kapila
Nyaya (School of Logic and Reasoning)	Aksapada Gautama
Vaisheshika (Atomism/Physics)	Maharshi Kanad
Yoga (Synchronisation of Body and Mind)	Patanjali
Uttar Mimansa (Metaphysics)	Badarayana
Purva Mimansa (Ritualism)	Jaimini

Vedangas

- They are tools to understand Vedas.
- They are philosophical teachings of Upanishads.
- There are total *six Vedangas*.

Siksha	Study of phonetics
Kalpa	Study of practices
Vyakaran	Study of grammar
Nirukta	Study of etymology
Jyoti	Study of light
Chhanda	Study of poetic matter

EARLY VEDIC AGE

- ***Mention of:*** *Himvanta* (Himalaya) and *Munjavat* (Hindu Kush) in *Rig Veda*.
- ***Mention of:*** *Sapta Sindhu* in *Rig Veda*.

Mention of rivers in Rig Veda
Saraswati (50–75 times),
Sindhu (30–35 times),
Yamuna (3 times),
Ganga (1 time, Mandala 10).

River	*Old Name*
Indus	Sindhu
Jhelum	Vitasta
Chenab	Askini
Ravi	Purushini
Beas	Bipasha
Sutlej	Shutudri
Saraswati	Saraswati (A mythical river)

- The *Chautang River's* old name is the *Drishadvati River*.

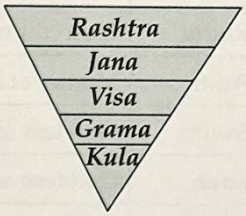
Battle of 10 Kings

- Battle of 10 Kings *(Dasarajna Yuddha)* mentioned in the *7th mandala* of *Rig Veda*.
- **Between:** *Bharata tribe* (leader: Sudas) vs *10 kings*.
- ***Won by:*** Bharata tribe
- It was fought on the banks of *Purushini (Ravi river)*.

Society

Social Structure

- Society was primarily tribal and largely egalitarian.
- The term "*Jana*" referred to a tribe or group of related families.
- Division into four varnas, based on profession (not hereditary).



Marriage & Family

- Child marriage was not prevalent.
- Monogamy was the general rule, though some princes practiced polygamy.
- *Niyoga* (widow remarriage) was allowed.

Status of Women

- Women enjoyed a fairly good position in society.
- They participated in religious and social life.

Economy & Wealth

- The cow (*Aghanya* – sacred) was considered the chief measure of wealth.
- A wealthy person was called *Gomat*.
- Battles for cattle were known as *Gavisthi*.

Polity

- *Tribal Kinship* (**Elective Monarchy**) was followed.
- The *Yajamana* was the householder who sponsored the Yajna, usually performed at his home.

Sabha	Community of privileged
Samiti	Community of common people
Vidhata	Community for religious purpose

Women could participate in both Sabha and Samiti

Ranking of Officials

Rajana	Tribal Chief
Purohit	Priest
Senani	Army Chief
Sangrihitri	Tax collecting officers
Shresthin	Merchants
Gramani	Village head

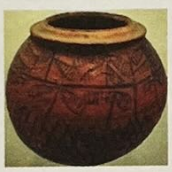
Religious Practices

- They Worshipped nature *(naturalistic polytheism)* and *no animal* was worshipped.
- They *did not* worship any idol.
- They performed *sacrificial prayers*.

Deities	*Worshipped As*
Indra	Purandara; destroyer of forts (lord of plough)
Prithvi	Goddess of nature
Agni	Intermediary between human and God
Soma	Lord of plants
Vayu	God of air
Varuna	God of Water or Rita
Rudra	Protector of Cattle
Aditi	Mother of Sun & Indra
Savitri	Goddess of purity
Raka	Goddess of prosperity
Sinivali	Goddess of fertility
Usha	Goddess of dawn

Pottery

- *Ochre* coloured pottery was used.



LATER VEDIC PERIOD (1000-600 BC)

- Samaveda, Yajurveda, and Atharvaveda were compiled.

Aryan's Expansion

- Aryans expanded from *Punjab* to western *Uttar Pradesh* (Ganga Yamuna doab).

Bal Ganagadhar Tilak compiled the book: The Arctic Home in the Vedas (he said *"all Indians were Aryans"*).

- ***Upper portion:*** *Kuru* & ***Middle part:*** *Panchal*
- *Iron* was *used* for the *first time*.
- Towards the later vedic period, they moved eastwards into the Gangetic plains. This expansion was facilitated by the use of *iron tools* and weapons, as well as *horses*.

↓

Krishna/Shyam (black) *Ayas* (metal)

The iron age site named Tekwada is located in Maharashtra.

Agriculture

- It was the chief means of livelihood.
- King also did manual labour in the field.
- *Vrihi:* Rice.
- *Yava:* Barley.
- *Godhuma:* Wheat
- *Dhanya:* Grains and Cereals

Political Organisation

- The political organizations became *centralised*.

Sabha	Dominated by Brahmins; women participation not allowed now
Samiti	Same as before (early Vedic period)
Vidhata	Disappeared during later Vedic period

Society: Varna System

Brahmans	Performed rituals/ sacrifices
Kshatriya	Participated in war and protected people
Vaishya	Conducts trade
Sudra	They did manual work

- Condition of women deteriorated.
- Varna system became *hereditary and rigid*.
- *Gotra (clan)* system emerged.

Marriage

- *Anulom vivah:* Boy from *higher caste* + girl from *lower caste*.
- *Pratiloma vivah:* Girl from *higher caste* + boy from *lower caste*.

Eight types of marriage were there:

Brahma Vivah	Marriage within same Varna with Vedic rituals
Gandharva Vivah	Love marriage
Daiva Vivah	Father donates his daughter to priest as Dakshina
Arsha Vivah	Groom gives a cow and a bull to bride's father (as Gratitude gesture)
Prajapati Vivah	Marriage without dowry
Asur Vivah	Marriage by purchase
Rakshasa Vivah	Marriage by abduction
Paishacha Vivah	In this type of marriage, a girl who is not in her senses is forcibly married off

Religious Practices

- Other Gods like *Rudra gained more importance* while *Indra* and *Agni lost their importance*.
- *Pushan* (god of cattle) came to be regarded as *God of Shudras*.
- **Prajapati:** *Creator of Universe*
- Idol worship gained importance.
- Animal sacrifice increased during this period.
- Different kind of *Yajnas* were performed such as:
  - *Rajsuya Yajna:* Performed for "*Coronation*"
  - *Vajpeya Yajna:* Performed after Rajsuya Yajna, also known as "*Drink of Strength*"
  - *Ashwamedha Yajna:* Performed for *Territorial expansion*.

Pottery

• *Grey* coloured potteries were seen here also known as *PGW (painted grey ware)*.

Summary of Vedic Period

Early Vedic Period	*Later Vedic Period*
Tribal Kinship	Territorial Polity
Pastoral community	Agriculturists
Better women condition	Condition of women deteriorated
Varna system was based on profession and was not rigid	Varna system became hereditary and rigid
No idol worship	Idol worship started
Rigveda was compiled during this time	Samveda, Yajurveda, and Atharvaveda were compiled during this time

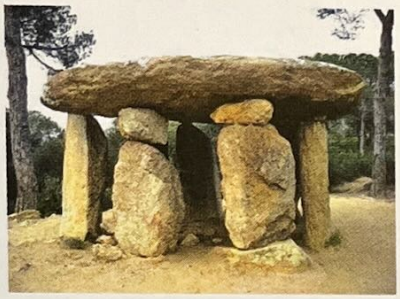
The indigenous inhabitants described in Vedic texts as hostile, dark-skinned, and non-Vedic are referred to as Dasyus (or Dasas

History of South India

- According to historical evidence, South India did not experience a distinct *Bronze Age* and directly transitioned to *Megalithic Age* (also known as *Iron Age in South India*) where 'there was use of large stone.
- *Time period: 2500-500 BC*

The history of South India starts with Chera, Pandya and Chola Dynasty.

Structures found in India



Dolmen (Found in graves)

Menhir

Pottery

- *Black* and *red* ware potteries were used.

Community

- They belonged to *pastoral community*. They knew about agriculture but did not practise it.

SANGAM AGE (3RD CENTURY BC- 3RD CENTURY AD)

- Meaning of the term 'Sangam': *Assemblies*.
- The area lying to the *South of Krishna* and *Tungabhadra*.
- A total of *3 Sangams* were held and all were patronised by *Pandyas*
- Assemblies were held at: *Tamil Nadu* and were known as *Muchchangam*.

The assemblies were:

Sangam	*Places*	*Chairman*
1st	Madurai	Rishi Agastya
2nd	Kapadapuram	Tolkappiyar
3rd	Madurai	Nakkirar

Sangam Literature

They are in two forms:

1. *Narrative (story):* They are collectively called *Melkannakku* → *18 major work.*

   E.g. Ethuthokai, Pattupattu

2. *Didactic (poetic):* They are collectively called *Kilkanakku* → *18 minor works* (these are about Love *(Akam)* and War *(Puram)*.

   E.g. Tirukkural, Naladiyar and Inna Narpathu.

- Composed in *Tamil language*.
- No text has been found from the 1st Sangam.
- **Patinenmelkanakku:** Collection of the oldest surviving *Tamil poetry*.

Tolkapiyyam is the earliest grammatical Tamil text composed by Tolkappiyar in 2nd Sangam.

Epics written During this time

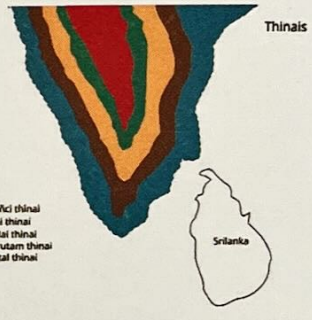
- *Silapathikaram:* It is written by *Ilango Adigal* that tells a story about a young merchant *Kovalan's* marriage to the virtuous *Kannagi* and his love for the courtesan *Madhavi*.
- *Manimekalai:* It is written by *Chithalai Chathanar* which is an epic story of Kovalan and Madhavi' s daughter *Manimekalai*.

Geography:

- *Thinais:* It refers to different types of landscape or geographical divisions of *Tamil Nadu*.
- Each Thinai had a chief called *Muvendar* (which was later divided into the *Cheras, Cholas, and Pandyas*).

Division of Thinais in five parts:

- *Kurinci thinai:* They engaged into *hunting* and *gathering*.
- *Palai thinai:* They were *cattle lifters* and *plunderers*.
- *Mullai thinai:* They did *animal husbandry*.
- *Marutam thinai:* They engaged in *agriculture*.
- *Neytal thinai:* They did *fishing* and *salt collection*.



Cheras

- They were ruling in *Kerala* and parts of *Tamil Nadu*.
- *Capital: Vanji/Vanchi/Karur*
- *Port cities: Muziris/Muchiris* and Tondi {mainly for trading).
- *Emblem: Bow and Arrow*
- *Greatest Chera: Senguttuvan* (He is also known as 'Red Chera') → he founded *Pattini cult*.
- They worshipped *Kannagi* (Goddess of *purity* and chastity → Pattini cult was related to this).
- *Pugalar Inscription* of Karur, Tamil Nadu mentions about them.

Cholas

- They were called as *'Cholamandalam' (Coromandels)*.
- *Capital: Puhar* and *Uraiyur* (alternate capital).

  Puhar is a port city and is also known as *Kaveripattinam*.
- *Emblem: Tiger*
- *Earliest ruler: Elara*

- ***Greatest ruler:*** ***Karikala*** (he fought ***Battle of Venni*** along the Kaveri river and also defeated the combined armies of ***Chera*** and ***Pandya***).
- They traded in ***cotton cloth*** (from Uraiyur).
- They were known for their ***efficient Naval power***.

Pandyas

- They ruled in ***Tamil Nadu***.
- ***Capital:*** ***Madurai*** (on the banks of ***Vaigai river***).
- ***Emblem:*** ***Fish***
- They were the first to be mentioned in Megasthenes book as ***"as being famous for their pearl trade"***.
- ***Port city:*** ***Korkai***
- They traded with ***Roman Empire***.

Society

The society was divided into:

Ruling Classes	Arasar
Traders	Vaishiyar
Rich class	Vellalar (rich landlords)
Lower class (landless labourers / slaves)	Kadaisiyar I Adimai
Ordinary Ploughmen	Uzhavur

- **Vattakirutal:** A king defeated in a battle committing ritual suicide by starving himself to death.
- The king was assisted by a council of ministers known as " ***Aimperumkuzhu*** ".
- Women enjoyed a respectable position in society.

The Periplus of Erythraean Sea (a Greek text) was written in the 1st Century AD.

- ***Muvendavelan*** and ***Araiyar*** were titles of rich landowners.

Form of Government

- During the Sangam period hereditary ***monarchy*** was the form of government.

JAINISM AND BUDDHISM

Cause of Origin

- **Opposition to Brahminical Dominance:** Rejected the *ritualistic interpretation of the Vedas* and *Brahminical supremacy*.
- **Agricultural Economy & Punch-Marked coins:** Vedic animal sacrifices harmed the agrarian economy. Use of Punch-Marked Coins expanded, facilitated commercial growth due to which *Vaishya* got wealthy, funded and *supported these religions* as their peaceful nature favoured their trade.
- **Varna System:** Rejected birth-based social hierarchy, *promoting equality*. Jainism linked Varna *to karma, not birth*.
- **Ahimsa (Non-violence):** Both philosophies centred on the strict practice of *non-violence*.
- **Kshatriya Leadership:** Mahavira and Buddha were Kshatriyas, reflecting a reaction *against Brahminical supremacy*.
- **Heterodox Philosophy:** *Rejected* the infallibility and authority of the *Vedas*, unlike orthodox traditions.
- **Concept of God:** Neither believes in a Supreme Creator. *Jainism* believes in *divine figures*, while early *Buddhism* is entirely *agnostic* regarding a creator.

JAINISM

- In Jainism, *Tirthankaras* are considered to be *great teachers*.
- There are total *24 Tirthankaras*.

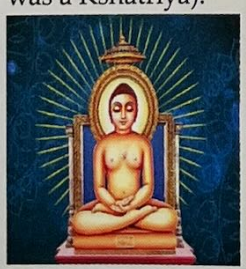
Important Tirthankaras

No.	*Names*	*Birth Place*	*Represented By*
1st	Rishabh Dev (Adinath)	Ayodhya	Bull
22nd	Arishtanemi (Neminath)	Sauripura	Conch (Shankh)
23rd	Parshavnath	Varanasi	Serpent
24th	Vardhaman Mahavir (Naya Putta)	Kundagram (Vaishali)	Lion

- In Vedas, only *two* Tirthankaras are mentioned: *Rishabh Dev (1st)* and *Arishtanemi (22nd)*.

Vardhaman Mahavir

- *Birth (540 BC):* *Kundagram (Vaishali; Bihar)*.
- *Death (468 BC):* *Pavapuri* (Bihar); at the age of *72 years*.
- *Father:* Siddhartha (Clan: Jnatrika; he was a Kshatriya).
- *Wife:* Yashoda
- *Daughter:* Priyadarshana *(Anojja)* was married to *Jamali* (*The first disciple of Mahavir*).
- Mahavir left home at the age of *30 years*; along with *Makkhali Gosala*.



- *Enlightenment:* At the age of *42 years*; under a *Sal tree* at Jambhikagrama near river *Rijupalika* and in the field of a householder named *Samaga*.
- *First Sermon at:* *Rajgir (Bihar)*

Terms related to Jainism

Moksha	Salvation / Release from the cycle of rebirth
Kaivalya	Enlightenment
Asrava	Inflow of karmic practices
Basadis	Jain monasteries
Kevalin	Perfectly learned
Jina	Jina is a being who has achieved enlightenment and is liberated from cycle of rebirth.

Ajivika Sect

- *Founder:* *Makkhali Gosala*
- This sect believed in *extreme fatalism* (fate) and *asceticism* (living extreme form of life by abstinence from worldly pleasure).

Jain Philosophy

Triratnas

- Three principles to achieve *Moksha*:

K	Right *Knowledge* (Samyaka Jnana)
F	Right *Faith* (Samyaka Darshana)
C	Right *Conduct* (Samyaka Charitra)

Five Principles of Living (Vows) → Panch Vrata

Ahimsa	Non-violence
Satya	Truthfulness
Asteya	Non-stealing
Aparigraha	Non-possession/Non-attachment
Brahmacharya	Celibacy/Chastity

Note

- Lord Mahavira added the fifth vow (vrata) of Brahmacharya to the four existing vows (*Chaturyama Dharma*) propounded by his predecessor, Parshvanatha.

Division among Jains

- *Chandragupta Maurya* and *Bhadrabahu* (A Jain Monk) left Magadha for Karnataka due to severe famine in Magadha and settled in *Shravanabelagola*, (Chandragiri hills, Karnataka) where Chandragupta Maurya embraced Jainism. He eventually undertook *Sallekhana* (ritual fasting} and passed away.
- Another group of Jains chose to remain in Magadha under the leadership of *Sthulabhadra*. Overtime, differences arose between these two groups.
- The followers of Bhadrabahu, who migrated to the *South*, adhered to strict ascetic practises, including *nudity as a mark of renunciation*, and came to be known as *Digambaras (sky-clad)*.
- On the other hand, the Jains who stayed in *Magadha*, led by *Sthulabhadra*, adopted more liberal monastic rules, permitting monks to *wear white clothes*. This group became known as *Shwetambaras (white-clad)*.

1st Jain Council

- **Leader:** *Sthulabhadra*
- **Place:** *Pataliputra*
- **Time period:** 298 BC
- **Text:** 12 Angas were compiled.
- **Patronised by:** Chandragupta Maurya

2nd Jain Council

Time Period: 512 AD

Place: *Valabhi, Gujarat*

Sanghabhuti, an Indian Buddhists who travelled to China at the end 4th century AD, was the author of a commentary on : Sarvastivada Vinaya.

Important Books of Jains

- *Bhagavati sutra (mentions about Mahajanapadas)*
- **Tattvartha/Tattvarthadhigama Sutra** (written by **Acharya Umaswati**): First book in Jain philosophy.
- *Agam sutra (sacred books of Jain religion)*
- *Kalpa sutra*

- *Bhadrabahu boycotted 1st Jain Council.*
- *Jain literature is written in Prakrit language*

Jain texts:

- **Parishishtaparvan**
- **Trishashtilakshana Mahapurana** (or Mahapurana).
- **Uttaradhyayana Sutra** (known for its verses on monk conduct, sermons and poetic teachings).

Architecture

- Statue of *Rishabh Dev* (Statue of *Ahimsa*) is *108 ft* tall, located at ***Mangi Tungi in Nashik***, Maharashtra.
- Statue of *Gommateshwara Bahubali* (son of Rishabh Dev) is *57 ft* tall, located in ***Shravanabelagola, Karnataka***, where *Mahamastakabhisheka* festival is celebrated every *12 years*.

Architecture	*Places*
Rock Cut Cave Temples	Odisha
Hathigumpha Caves	Odisha, Kharavela
Udayagiri and Khandagiri Caves	Odisha
Dilwara Jain Temple	Rajasthan (Mt. Abu)
Statue of Gomateshwara/ Bahubali	Karnataka, Shravanabelagola
Ellora Caves	Maharasthra
Khajuraho	Madhya Pradesh

BUDDHISM

- The founder of Buddhism was *Gautam Buddha*.

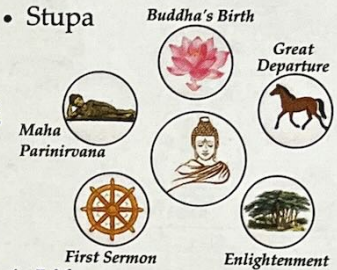
Gautam Buddha (563BC-483BC)

- *He belonged to:* Shakya Clan.
- He was also known as *Shakyamuni, Tathagat*.
- *Birth: Lumbini, Nepal*
- *Death: Kushinagara, Uttar Pradesh*
- *Childhood name: Siddhartha*
- *Father:* Suddhodhana (Kshatriya)
- *Mother:* Mahamaya (belonged to *Koliya tribe*).
- *Step-mother:* Mahaprajapati Goutami (*first Bhikkhuni*)
- *Wife:* Yashodhara
- *Son:* Rahul
- Buddha left home at the age of *29 years*.
- *First teacher:* Alara Kalama, *Second teacher:* Udraka Ramputra
- *Enlightenment:* At the age of *35 years*, *Uruvela* (Bodh Gaya); under a *Bodhi tree* (peepal tree) for *49 days* near river *Niranjana*.
- *First sermon: Sarnath; Varanasi*
- *Buddha Purnima* is observed to commemorate the birth, enlightenment, and death of Buddha .
- Gautam Buddha is considered as *"Light of Asia"*.

Aniconic (symbolic) forms of Buddha

In early Buddhism, the Gautama Buddha was not depicted in human form but through symbols such as:

- Empty throne (seat)
- Footprints (Buddhapada)
- Dharma Chakra (wheel)
- Bodhi tree
- Stupa



Disciples of Gautam Buddha:

- Sariputta
- Moggallana
- Mahakasyapa
- Upali
- Ananda
- Subhuti

Important Symbols of Buddha's Life

Terms	*Meaning*	*Symbol*
Janma	Birth	Lotus/ Bull
Nirvana	Enlightenment	Bodhi tree
Dharmachakra pravartana	First Sermon	Wheel
Maha bhinishkramana	House renunciation (Great departure)	Horse (Kanthak)
Parinirvana/Maha parinirvana	Death	Stupa

Philosophy of Buddhism

There are four noble truths:

1. The truth of suffering.
2. The truth of the cause of suffering i.e., desire.
3. The truth of the end of suffering.
4. The truth of the path to the end of suffering i.e. Eight Fold.

Eight Fold Path or Ashtangika Marga

It is followed to end sufferings.

- *Right mindfulness*
- *Right view*
- *Right concentration*
- *Right action*
- *Right livelihood*
- *Right intention*
- *Right speech*
- *Right effort*

Triratnas of Buddhism

- *Buddha*
- *Dhamma*
- *Sangha (community of monks)*

Mudras of the Buddha: A Guide to Enlightenment

Dharmachakra Mudra
"*Teaching Wheel*"
Represents the Buddha's teachings

Abhaya Mudra
"*Fearless*" Signifies protection and overcoming fear.

Bhumisparsha Mudra
"*Touching the Earth*"
Represents the Buddha's enlightenment.

Varad Mudra
"*Generosity*"
Represents giving and compassion.

Dhyana Mudra
"*Meditation*" Signifies contemplation and inner peace.

Vitarka Mudra
"*Wheel of Law*"
Represents reasoned discussion and the transmission of Buddhist teachings.

Buddhist Councils

Buddhist Council	*Place*	*Patronage*	*Presidency*
1st	Rajgriha (400 BC/ 483 BC)	Ajatshatru	Mahakashyapa
2nd	Vaishali (383 BC)	Kalashoka	Sabakami
3rd	Pataliputra (250 BC)	Ashoka	Moggaliputta Tissa
4th	Kashmir (72 AD); Kundalvana	Kanishka	Vasumitra

- *In 4th Buddhist Council, Buddhism was divided into two sects: Mahayana and Hinayana.*

Sects of Buddhism

Hinayana	*Mahayana*	*Vajrayana*
They do not believe in idol worship	They believe in idol worship	Tantric Buddhism (In the East Asia)
Text: Pali	Text: Sanskrit	Roots: Tibet
They do not believe in rebirth of Buddha	They believe in rebirth of Buddha	
Seen mostly in: Southern India, Sri Lanka, Cambodia, etc.	Seen mostly in: Japan, China, South Korea	Seen mostly in: Sikkim, West Bengal, Nepal, Tibet, East Asia

- *Theravada Buddhism: A subtype of Hinayana Buddhism*
  - *Meaning: Theravada = "Doctrine of the Elders"*
    Thera (Senior Monk) + Vada (Doctrine)
  - *Origin: India*
  - *Theras: Senior Buddhist Monks*
  - *Theris: Senior Buddhist Nuns*

Buddhist Texts

Tripitaka / Pali Canon

- *Sutta Pitaka:* Collection of the Buddha's teachings, sermons, and dialogues
- It was compiled by Ananda.

Pitaka meaning: Basket

- It is divided into five parts, known as Nikayas.
  1. *Digha Nikaya*
  2. *Majjhima Nikaya*
  3. *Samyutta Nikaya*
  4. *Anguttara Nikaya*
  5. *Khuddaka Nikaya*
- *Vinaya Pitaka:* Monastic courts and rules.
- *Abhidhamma Pitaka:* Interpretation of Sutta Pitaka and philosophical matters.

Dhammapada, a Buddhist text, is called the "Gita of Buddhism" for its importance and teachings. It is a part of the Khuddaka Nikaya.

Literature In Pali language

- *Milindpanho:* Dialogue between *Milinda* and *Nagasena* (a Buddhist monk).
- *Visuddhimagga:* Written by Buddhaghosa.
- **Nettipakarana**
- **Dipavamsa**
- **Mahavamsa**

Literature In Sanskrit Language

- *Buddhacharita*: Buddha's biography by *Ashvaghosha*.
- *Jataka Tales*: It is about previous births of Buddha in both *human* and *animal forms*.
- **Avadanasataka**
- **Divyavadana**
- **Arya Manjushri mula kalpa**

Bodhisattvas

- A Bodhisattva is a being who seeks *enlightenment* (Bodhi) not just for themselves, but for the benefit of all *sentient beings*. The concept is centered to *Mahayana Buddhism*, where Bodhisattvas delay their own *Nirvana* to help others attain liberation.

Important Bodhisattvas :

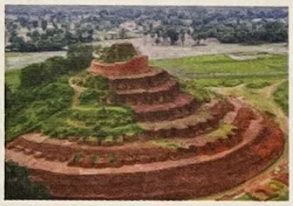
- **Padmapani:** A bodhisattva who is also known as *Avalokiteshvara*.
- **Vajrapani:** A bodhisattva who is a *protector* and a *guide*.
- **Manjusri:** A bodhisattva who represents *wisdom* and is considered the *Buddha-to-be*.
- **Amitabh:** A bodhisattva who represents *light*.

Some important terms

Terms	Meaning
Chaitya	Place of worship
Vihara	Place of residence
Dhamma	Dharma
Stupa	Mount where the relics of Buddha have been placed

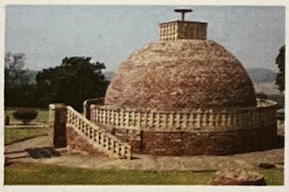
Buddhist Stupas

Stupas	Places
Kesariya	Bihar (Largest Stupa in India)
Dhamek	Sarnath, Uttar Pradesh (Cylindrical Shape)
Ramabhar	Kushinagara, Uttar Pradesh
Sanchi	Madhya Pradesh (Oldest Stupa in India)
Shanti	Ladakh (White in colour)
Chir Tope (Dharmarajika)	Taxila, Pakistan
Piprahwa	Uttar Pradesh (First built by Sakya Dynasty)
Bharhut	Madhya Pradesh
Borobudur	Java, Indonesia (Largest Stupa in the world)



Kesariya Stupa

Built by: *Ashoka*
Excavated by: *K. K. Muhammed*
Discovered by: *Colin Mackenzie* in 1814
Further works done by: Gupta Dynasty



Amravati Stupa

Built by: *Satavahanas*
Location: Andhra Pradesh
Discovered by: *Colin Mackenzie* in 1797.

Important Monasteries

- Ladakh: **Thiksey, Hemis, Alchi Gompa**
- Himachal Pradesh: **Kye Gompa**
- Sikkim: **Rumtek**

- *Guntapalle Buddhists Caves (Andhra Pradesh) built by Buddhists monks during the rule of Satavahanas.*
- **Bagh Caves:** *Madhya Pradesh*

Eight holy places of Buddhism

- **Lumbini**
- **Bodh Gaya**
- **Sarnath**
- **Kushinagara**
- **Rajgir**
- **Vaishali**
- **Shravasti**
- **Sankosia**

Namdroling Monastery (a Buddhist Monastery) is located in Bylakuppe, Karnataka is also known as "The Golden Temple".

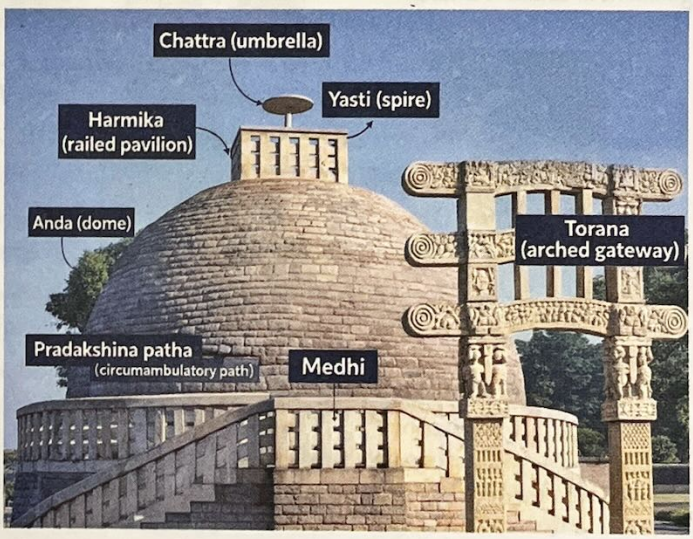
The term Sramanas (or Shramanas) refers to the wandering ascetics or monks in ancient India who renounced worldly life to pursue spiritual liberation through practices like meditation, austerity, and ethical living. They were often associated with non-Vedic traditions such as Buddhism and Jainism.

Sanchi Stupa

- It is the *oldest Stupa of India* built by *King Ashoka* in 3rd Century BC.
- The enlargement of Stupa was done using *Sandstone* by *Shunga Dynasty*.
- It has *four Gateways* which represents cardinal points → North, South, West and East direction. They were added by Satavahanas.

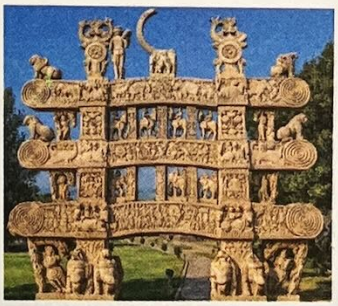
Buddha Purnima is observed to commemorate the birth, enlightenment, and death of Buddha.

- *First discovered by: Henry Taylor in 1818.*
- *Chethiyagiri festival* is celebrated at Sanchi.
- Relics of two important disciples of Buddha → *Sariputta* and *Moggallana* are kept here.



Parts of a Stupa

- *Anda:* Hemispherical dome
- *Torana:* Gateway
- *Medhi:* "Processional / Ambulatory Path
- *Vedika:* Railings
- *Pradakshina patha:* A circular path around stupa where devotees walk around.



Torana

- *The Yakshi is a female nature spirit symbolizing fertility, abundance, and prosperity.*
- *It appears on Sanchi Stupa Toranas as guardian and auspicious figure.*

Anatta: It is the Buddhist doctrine that a permanent soul or self does not exist.

Hariti
A blood thirsty yakshi converted by Buddha to a benevolent maternal figure.

Gaj Lakshmi
A yakshi surrounded by lotuses and elephants.

Didarganj Yakshi

A female statue with polished stone found in Patna, Bihar. Right now preserved in the Patna museum. Its right hand holds a fly whisk called "Chauri" and the lower garment is called "Antari"

Salabhanjika Yakshi
Reference to mother of Buddha (Maya) under sala tree giving birth to Buddha

Prajnaparamita Yakshi
Female deity in Buddhism, source of omniscience of all Buddhas and mother of all Buddhas

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MAHAJANAPADAS

- Aryans are considered the most powerful tribes during the Vedic period, and gradually transitioned to *"Mahajanapadas"* (great kingdoms) by the end of *later Vedic Period*. By forming territorial units called *"Janapadas"*.
- Aryans lived in the land known as *"Sapta Sindhu"*.

Aryans → Tribes → Jana → Janapadas → Mahajanapadas
{consolidation of Jana (Aryans)}

- *Total: 16 Mahajanapadas*

Sources

- Texts: *Ashtadhyayi* (in Sanskrit) written by *Panini* (oldest book on *Sanskrit Grammar* written in *600 BC to 300 BC*).

Buddhist Literature

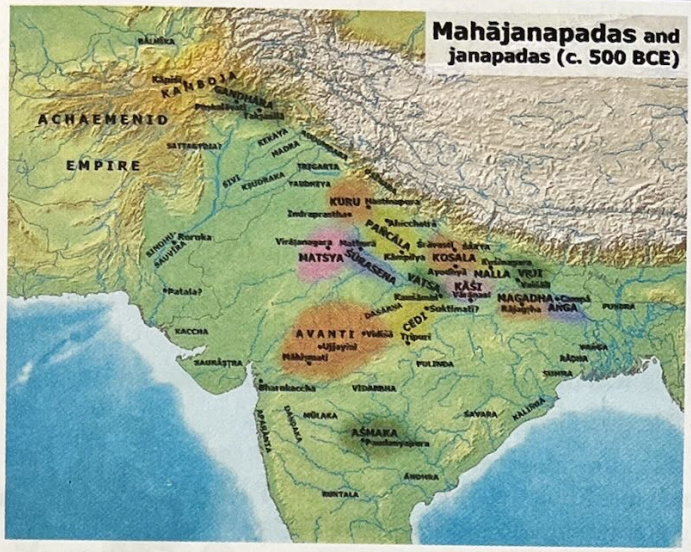
- *Anguttara Nikaya* (In it 16 Mahajanapadas are mentioned).
- *Digha Nikaya* (In it 12 Mahajanapadas are mentioned).

Jain Literature

- *Bhagavati Sutra*.
- Mahajanapadas were either *Monarchial* (single decision makers) or Republic (multiple decision makers), also known as *oligarchy*.
- The following Mahajanapadas were Republic → *Kuru, Kamboja, Vajji, Malla*.

Mahajanpadas	*Capital & River*
Anga	Champa (Ganga)
Magadh	Rajagir/ Pataliputra (Ganga & Son)
Kasi	Varanasi (Gomti)
Vatsa	Kausambi (Ganga)
Kosala	Sravasti / Ayodhya (Sarayu)
Surasena	Mathura (Yamuna)
Panchala	Ahichchhatra / Kampilya (Ganga)
Kuru	Indraprastha (Yamuna)
Matsya	Viratnagar (Yamuna)
Chedi/Chetiya	Sothivati/ Banda (Ken & Betwa)
Avanti	Ujjain (North)/ Mahismati (South) (Kshipra & Narmada)
Gandhar	Taxila (Indus)
Kamboj	Pooncha (Kabul & Kurram)
Asmaka/Assaka	Pratishtan/ Paithan/ Potana (Godavari)
Vajji	Vaishali (Gandak)
Malla	Kusinara (Sarayu)

- *Vajji* consisted of *eight clans* and three of them were the most powerful kingdoms → *Jnatrika, Videha, Lichchavi*.



- In the beginning *Kasi* was the most powerful Mahajanapada followed by *Kosala* then *Magadha* became the most powerful one.

Factors Contributing to the Rise of Mahajanapadas

- **Use of Iron:** Iron tools increased agricultural productivity and supported larger population.
- **Urbanisation:** Growth of cities like Rajagriha, Vaishali, Varanasi, Ujjain, Taxila.
- **Rise of trade:** Trade got boosted due to trade route and these routes were started to get controlled.
- **Decline of Tribal polity:** As the population grew, there was a need to set permanent boundaries.
- **Strong military Organisation:** To solve conflicts over fertile land armies need to be organized.
- **Social Stratification (Varna System):** Varna system supported the emergences of Kshatriya who controlled territories.
- **Geographical Factors:** Ganga plain had fertile alluvial soil which gave more productivity in agriculture.

Reasons for the Rise of Magadha

- Its advantageous position → situated *south of Ganga*.
- The capital *Rajgriha* was surrounded by *five hills* and *Pataliputra* was situated at the confluence of *Ganga* and *Son*.
- The availability of large number of *elephants* (as it was marshy-doab region).
- It had many great leaders.
- Availability of *Iron mines* (in *Jharkhand region*).

DYNASTIES THAT RULED MAGADHA

Haryanka Dynasty

Bimbisara (544 BC-492 BC)

- *Title: Seniya*
- He led military campaign against *Anga*.

- He had *three wives*:
  - *Kosala Devi* → Sister of *Prasenjit* (son of Kosala King)
  - *Chellana* (Lichchavi princess)
  - *Khema* → Madra Clan (Punjab)
- He sent physician '*jivaka*' to *Ujjain* king *Pradyota*, who was suffering from *jaundice*.

Ajatshatru

- He was the son of *Chellana* and *Bimbisara*.
- He established *Patliputra*.
- He introduced advanced military tech including the *Mahashilakantaka* (a giant catapult) and *Rathmoosai* (a scythe chariot)

- He conquered *Lichchavi* and *Vaishali*.
- He defeated Kosala King and married to his daughter.
- He patronised the *1st Buddhist Council*.
- He later *killed* his father *Bimbisara*.
- **He was contemporary of Buddha and Mahavira.**

Udayin

- He shifted the capital temporarily from *Rajgriha to Patliputra* (now: *"Patna"*).

Shishunaga Dynasty

- ***Founder:*** *Shishunaga*
- Shishunaga defeated *Nagadasaka*, the last ruler of the *Haryanka Dynasty*.
- He defeated *Avanti* and merged it with *Magadha*.
- *Kalashoka*, the second ruler of the Shishunaga dynasty, permanently shifted the capital to Pataliputra and patronized the *Second Buddhist Council* at Vaishali.

Nanda Dynasty

Mahapadmananda

- He was the founder of *Nanda dynasty*.
- **Title taken:** *Ekarat* (Sole Sovereign) and *Sarvakshatrantaka* (Destroyer of all Kshatriyas).

Dhananada

- Alexander invaded India during his reign (326 BC).
- He introduced *"Nandopakramani"*, a measuring unit

In the battle of Hydaspes Alexander defeated Porus on the banks of Hydaspes (Jhelum) in 326BC.

- He was the *last king* of Nanda Dynasty.

Pottery

- *Northern black polished wares* (NBPW) were used for pottery.

Coins

- *Punch-marked coins* made of *silver* were used as the form of money for trade purposes.
- Gold coins such as *Nishka* and *Satmana* were also used.

Trade

- Artisans and merchants formed associations called *Shrenis (Guilds)* that were collectively referred to as *Nigama*.

Craft and Architecture

- Craft was *hereditary*.
- Iron ploughshare played a crucial role in the empire's agricultural success (**second urbanization after Harappa**).

Terms

Terms	*Meaning*
Bhojaka/ Gramabhojaka	Village Headman
Gahapatis	Wealthy property owners, who employed Slaves or Hired Labourers
Shaulkika/Shulkadhyaksha	Toll–tax collecting officers
Bhaga	Tax (1/6th of produced)
Bali	Voluntary Offerings to the king

MAURYA DYNASTY

Sources for the Mauryan Empire

- *Kautilya's Arthashastra:*
  - Arthashastra describes the *administration* and *state policies* of Mauryan Empire during Chandragupta Maurya's time.
  - Consists of *15 books,* called *"Adhikaranas"*; first 5 books were based on *"Tantra"* - internal administration and next 8 books were on *"Avapa"* - interstate relation, last 2 books were miscellaneous.

Chanakya is often compared with Italian Renaissance writer - Niccolo Machiavelli (author of Prince)

- *Vishakhadatta Mudrarakshasa:* It is a *Sanskrit* play that narrates the ascent of emperor Chandragupta Maurya to power in India. This play describes he belonged to *lower caste*.
- *Indica* written by *Megasthenes*: It includes all the detailed account of how things were run in Mauryan Empire.
- *Buddhist Literature*: **Jataka tales, Dipavamsa/Mahavamsa, Divyadana**.
- *Archeological Evidence:* Pillar edicts, Rock edicts .
- Wooden architecture of Chandragupta Maurya found at *Bulandi Bagh* and *Kumhrar*, discovered by *L. A. Waddell*.

Chandragupta Maurya (322 BC-298 BC)

- He was the **founder of Mauryan Dynasty** and ascended the throne by defeating the last ruler of Nanda Dynasty *Dhanananda*, with the help of *Kautilya* (also known as *Chanakya/Vishnugupta*) in *322 BCE*.
- The Vishnu Purana, explicitly connects Chandragupta to the Nanda dynasty through his mother, Mura, a Shudra concubine of Dhanananda.
- **Son:** *Bindusara*.
- He built a department *"Kosthagara"*: For storage of *grains* (mentioned in *Sohgaura: Copper Plate inscription in Gorakhpur, Uttar Pradesh*)
- He defeated *Seleucus Nicator* (General & Successor *Alexander*).

About Seleucus Nicator

- Seleucus Nicator founded *Seleucid Dynasty* (member of Macedonian Greek Dynasty) ruling in Northwestern parts of the Indian subcontinent.
- *Megasthenes* was in the court of Seleucus Nicator.
- Chandragupta Maurya defeated Seleucus Nicator and married to his daughter *Helena*.

Bindusara (297BC-273 BC)

- He is also known as *Amitrochates"* (destroyer of enemies) by the *Greek*.
- He asked for sweet wine, dry figs and a philosopher from *Antiochus I* of Syria.
- He is known for conquering the land between the two seas, extending the Mauryan Empire up to the southern tip of India.
- He patronised *Ajivikas*.
- He was visited by Greek ambassador → *Deimachus*.
- Mother: *Durdhara* • Son: *Ashoka*.

Ashoka (268 BC-232 BC)

- Ashoka ascended the throne with the help of *Radhagupta (Minister)*.
- During his father's reign, Ashoka was *governor of Taxila and Ujjain.*
- He fought *Kalinga War* with *Raja Anantha Padmanabha,* the ruler of the *independent kingdom* of Kalinga in 261 BC, *7 years* after his coronation.
- He replaced *Berighosha* (physical conquest) with *Dhammagosha* (cultural conquest) after the Kalinga War.
- He sent his son *Mahendra* and daughter *Sanghamitra* to *Ceylon* (now known as *Sri Lanka*) to spread Buddhism.
- He was succeeded by *Dashrath Maurya* (grandson of Ashoka).

Ashokan Edict

- Edicts of Ashoka are found in *Rocks and Pillars*.
- There are *14 Major Rock Edicts* of Ashoka meaning a maximum of *14 lines* are engraved in Rocks.

- *William Jones (founder of Asiatic Society of Bengal, 1784).*
- *James Princep was the 1st to decipher Ashokan inscriptions in 1837.*

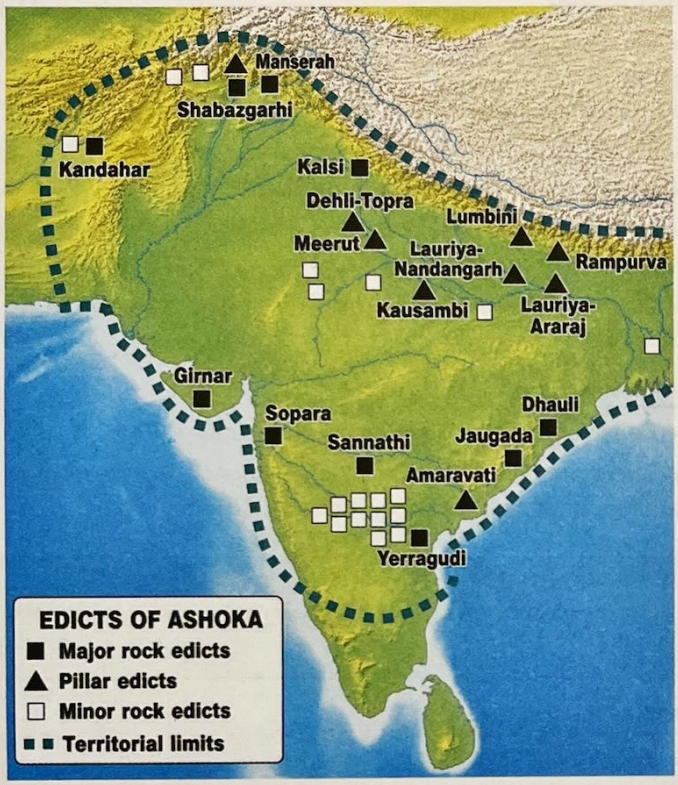
Major Rock Edicts

- ***Total:*** 14
- ***Total languages:*** 3 (Prakrit, Greek, Aramaic)
- ***Total scripts used:*** 4 (Brahmi, Kharosthi, Greek, Aramaic)
- ***Most inscriptions were in:*** *Prakrit language in Brahmi script*
- ***Script used in Afghanistan:*** Greek and Aramaic
- ***Script used in Northwestern parts of India:*** Kharosthi
- *Ashoka's Dhamma* was *inspired* by the Buddhist *"Upashaka Dhamma"*, which refers to the Buddhist teaching for laymen.
- In Ashoka's Greek and Aramic inscriptions no reference to teaching of Buddha was found but in his *Brahmi Khroshthi,* and *Prakrit inscription Buddhism was mentioned*.
- In inscriptions he is mentioned as: *Devanami Piyadassi* (***Meaning:*** Devon ka Priya → Beloved of God)

10 Places where Ashokan Rock Edicts have been Found

1. ***Kandahar Bilingual Inscription*** → Kandahar, Afghanistan
2. ***Shahbazgarhi in Kharoshthi script*** → Khyber Pakhtunkhwa, Pakistan

3. ***Mansehra Rock Edicts*** → Mansehra, Khyber Pakhtunkhwa province, Pakistan
4. ***Kalsi*** → Dehradun, Uttarakhand
5. ***Girnar*** → Gujarat (14 lines are inscribed in Girnar major Rock Edicts).
6. ***Sopara*** → Maharashtra
7. ***Dhauli*** → Bhubaneshwar, Odisha
8. ***Jaugada*** → Odisha
9. ***Sannati*** → Karnataka
10. ***Yerragudi*** → Kurnool district, Andhra Pradesh

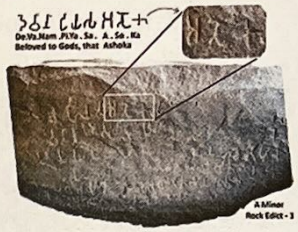


14th Major Rock Edicts of Ashoka	
** *Edict 1*	**Prohibits animal slaughter. Ban festive gatherings and the killing of animals. Only two peacocks and one deer were killed in Ashoka's kitchen. He wished to discontinue this practice also.**
Edict 2	Providing care for man and animals describes Chola, Pandaya, kingdoms of south India.
Edict 3	Generosity to Brahmans.
** *Edict 4*	**Dhammaghosa over bherighosa.**
Edict 5	Concerns over policy towards slaves.
Edict 6	Welfare measures
** *Edict 7*	**Requests tolerance for all religions**
Edict 8	Describes Ashoka's first Dhammayatra to Bodh Gaya and Bodhi tree
Edict 9	Condemns popular ceremonies. Stress on ceremonies of dhamma.
Edict 10	Condemns the desire for fame and glory. It stresses the popularity of Dhamma.
Edict 11	Elaborates dhamma.
** *Edict 12*	**Directed and determined requests for tolerance among different religious sects.**
** *Edict 13*	**Ashoka's victory over Kalinga (old name of Odisha)**
Edict 14	Describes engraving of inscriptions in different parts of the country.

*14 Rock Edicts and Inscriptions of Ashoka (**are important)*

Minor Rock Edicts

- Minor Rock edict 1 provides the evidence of gradual religious transformation of Ashoka to Buddhism.
- Four Edicts where Ashoka has been mentioned by his name. These four are:
  - **Maski** → Karnataka
  - **Nettur** → Karnataka
  - **Brahmagiri** → Karnataka
  - **Gujjara** → Madhya Pradesh



Name "Ashoka" mentioned in Maski Stone slab

- Maski Ashoka inscription was discovered by *C. Beadon.*

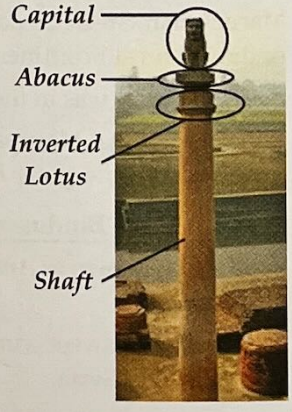
Aspect	*Major Rock Edicts (MREs)*	*Minor Rock Edicts (MiREs)*
Number	14	15-16
Date	Middle Phase of Ashoka's reign (257 BCE)	Later phase of Ashoka reign
Length & detail	Long, Detailed and Systematic	Short, Brief and Personal
Content focus	Dhamma, Governance, Social welfare, Religious tolerance, Administration	Buddhism
Tone	Imperial and Administrative	Personal and Confessional
Historical importance	Full philosophy of Ashokan Dhamma	Ashoka's Conversion to Buddhism
Language & script	Prakrit (Brahmi), in North west Prakrit (Kharoshthi)	Prakrit (Brahmi)
Geographical spread	Entire Mauryan Empire	Central and southern India
Examples	Girnar, Kalsi, Shahbazgarhi, Mansehra	Maski, Bairat, Gujjara, Siddhpura

Pillar Edicts

- *Total: 7 (meaning: 7 lines)*

Delhi Topra Pillar Edict

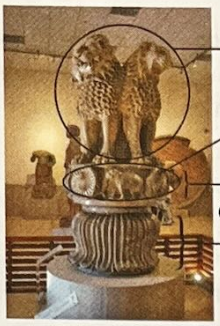
- It comprises all the 7 Ashokan Pillar Edicts and the *7th Edict* is considered as the *longest* amongst them all.
- Only one language *(Prakrit)* and only one script *(Brahmi)* is used.

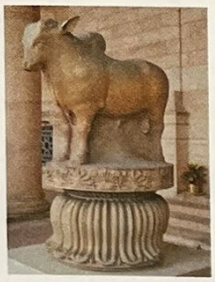


- Delhi Topra Pillar was transferred from *Haryana* to in *Delhi* by *Firoz Shah Tughlaq*.
- The painted illustration of the moving of the Ashoka Pillar at Topra is found in *Sirat-i-Firuz Shahi*.

Ashoka Pillar, Sarnath

- It was adopted as the National Emblem on *26th Jan 1950*.
- Here, Ashoka commemorated the first Sermon of Buddha.
- ***Animals: Lion, Elephants, Horse, Bull***





Rampurva Bull

- Placed in President House.
- Found in Bihar.

Bihar Edicts
- *Lauriya Areraj (capital not found)*
- *Lauriya Nandangarh*

- *Barabar Hill Caves* (Built by Ashoka for Buddhist monks) and *Nagarjuni Caves* (Built by Dashrath Maurya, grandson of Ashoka) in Bihar are considered as the oldest surviving rock-cut caves in India.
- *Lomas Rishi Caves* in Bihar.
- *Konagamana/Kanakamuni Stupa* → Rebuilt by Ashoka (after he visited *Nigali Sagar*).

Inscriptions

Nigali Sagar Inscription (Nepal): It confirms that Ashoka enlarged the stupa of the Kanakamuni Buddha.

Rummindei Pillar inscription

- Also known as *Lumbini Pillar Edict* located in *Nepal*.
- It depicts that Ashoka traveled to the Buddha's birthplace. He *reduced taxes* of the people living in that area.

Mauryan Administration

- *Saptanga Theory by Kautilya:* He mentioned *7 elements* to rule an administration effectively.

1. *Raja: King*
2. *Amatya: Secretary*
3. *Janpada: Territory*
4. *Durga: Fort*
5. *Kosha: Treasury*
6. *Danda: Army*
7. *Mitra: Friend*

Provinces under Mauryan Administration

Provice	*Capital*
Prachyapatha (East)	Tosali
Avantipatha (West)	Ujjain
Uttarapatha (North)	Taxila
Dakshinapatha (South)	Suvarnagiri
Prachi (Imperial Capital)	Pataliputra

Tax System

- Tax paid in gold: *Hiranya*.
- Emergency tax: *Pranaya*.
- Taxes paid in kind by villages: *Pindakara*.
- Army maintenance tax: *Senabhaktam*.
- Extra tax: *Parsvam*.

Two Types of Courts

1. *Dharmasthiya Nyayalaya:* Presided by *Vyavaharika* (personal disputes).
2. *Kantakasodhana Nyayalaya:* Presided by *Pradeshta* (disputes between state and people).

Officers

- *Sannidhata:* Chief treasury officer (CTO)
- *Samaharta:* Collector general of revenue
- *Gopa:* Responsible for account
- *Akshapatalik:* Accountant General/ Audit Officer
- *Nagaraka:* Responsible for city administration
- *Sitadhyaksha:* Superintendent of Agriculture
- *Samsthadhyaksha:* Responsible for market
- *Navadhyaksha:* Superintendent of ships
- *Ashwadhyaksha:* Commanding officer of the cavalry
- *Shulkadhyaksha:* Superintendent of Toll Tax
- *Akaradhyaksha:* Superintendent of Mines
- *Dhamma Mahamatta:* New post created by Ashoka to check if people are following the concepts of Dhamma

Indica – Account of the Mauryan Empire by Megasthenes

- It mentions about administration and society of Mauryan period.
  - *Municipal Administration:* Managed by 6 committees, each consisting of 5 members.
  - *Military Administration:* The army was also organized under 6 committees, each with 5 members.

- Megasthenes divided Mauryan society into *7 classes*.

	TRICK (PCS TWO C)
1. *Philosophers*	→ *P*
2. *Cultivators/Farmers*	→ *C*
3. *Hunters and Shepherd*	→ *S*
4. *Traders*	→ *T*
5. *Warrior*	→ *W*
6. *Overseer (spy)*	→ *O*
7. *Councillor*	→ *C*

Megasthenes described Pataliputra as a large and beautiful city, surrounded by a massive wall. The city had 570 towers and 64 gates, showcasing its grandeur and strategic importance.

Arthashastra

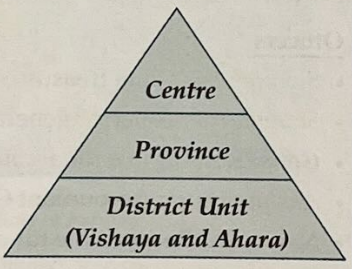
- *Kautilya* proposes a *seven-part structure* for the state including the king, ministers, territory, forts, treasury, military, and allies (also known as *saptanga theory*)
- *Women* occupied *higher positions* in society and were a part of *Army*.

Society

- Society was divided into *4 varnas*.
- Social order based on the *Dharma*, *Varna* and *Ashrama* systems.
- *Antyaja:* Without any caste.
- *8 types* of marriages were mentioned and *divorce was allowed*

Provincial Administration:

- Provincial administration was divided in: *Centre, Province* and *District* Unit
- *Silver* was extensively used for *coinage* in the Mauryan Empire.



- ***Sthanika:*** Head of several villages
- ***Gramika:*** Head of the village

Provincial Officers

- ***Kumar or Aryaputra or Pradeshika:*** Provincial head
- ***Mahamatya:*** Senior Administration officer
- ***Amatya:*** Executive officials
- ***Yukta:*** Revenue Assessment
- ***Rajjuka:*** Judicial officers

Forest Regulation

- ***Integration:*** Tribal incorporation for control and revenue.
- ***Regulation:*** Forest produce under state tax and supervision.
- ***Conservation:*** Burning prohibited; protected timber and elephants.
- Recruitment: Tribes used as troops, spies, and assassins.

Ports

- West: *Bharuch (Gujarat), Sopara (Maharashtra)*.
- East: *Tamralipti (Bengal)*.

Note: The last ruler of Mauryan Dynasty *Brihadratha Maurya* was *killed* by his military commander *Pushyamitra Shunga* which led to the start of Shunga Dynasty.

SHUNGA DYNASTY

Pushyamitra Shunga (185 BCE)

- Founder of *Shunga Dynasty*.
- *Capital:* *Vidisha* (presently in *Madhya Pradesh*).
- He followed *Brahmanism* and was a devotee of *Shiva*.
- He patronised *Buddhism*.
- *Son:* *Agnimitra* → A play by *Kalidasa* *"Malvikagnimitra"* tells a story about love of *Agnimitra* and *Malvika*.
- According to *Patanjali's* book *"Mahabhashya"*, Pushyamitra Shunga performed two *Ashwamedha Yagya* (Patanjali was contemporary to Pushyamitra Shunga).

Devbhuti

- He was the *last ruler* of Shunga Dynasty and was killed by his Commander *Vasudev*.

Danabhuti enlarged the Bharhut Stupa, Madhya Pradesh.

KANVA DYNASTY

- *Founder:* *Vasudeva Kanva*.
- *Capital :* *Patliputra*
- *Religion :* *Brahman Dynasty*
- Kanva's were known as *"Shungabhrityas"* which means *"Servants of Shungas"*.

SATAVAHANA DYNASTY (60 BC - 225 AD)

- *Founder:* *Simuka Satavahana* (Associated with the Inscription of Naneghat, Maharashtra)
- Satavahanas are mentioned in *Puranas*.
- Satavahanas were also known as *Andhras/Andhrabhrityas* they ruled in Deccan → Present day: Maharashtra region).
- *Capital:* *Paithan/Pratisthan* (Maharashtra).
- *Greatest ruler:* *Gautamiputra Satkarni*.
- This dynasty embraced *Brahmanism*.
- They had *matrilineal* society (they took names of their mothers).
- Use of the *Prakrit* language can be seen.
- Satavahana Kingdom was divided into *Ahara* or *Rashtras* (means districts).
- This dynasty started the practice of *donating* the *land* to *Brahman* and *Buddhist monks*.
- *Ghantasala* is an ancient port and Buddhist center in Andhra Pradesh.
- They started *lead coins* (traded these lead coins with the Romans) and other form of coins such as Copper, Bronze, Potin.
- Satvahana ruler *Vasisthiputra Pulumavi* was defeated by *Rudradaman I* (Saka ruler).

Satakarni I (70 BC - 60 BC)

- He is described as the *Dakshinapathapati* or *Lord of Dakshinapath* (Deccan region) on the **Nasik Inscription**, by his wife *Nyanika*.
- His name is also mentioned in the *Hathigumpha inscription*.

Gautamiputra Satakarni (106 AD-130 AD)

- *Title:* *Ekabrahmana/Kshatriyadarpa Mardana* (Destroyer of pride of Kshatriyas).
- He carried on the practice of donating the land to Brahmana and Buddhist monks.
- He claimed to have started the practice of fourfold *Varna system*.
- He defeated *Kshatrapa Nahapana*, one of the Saka rulers (this is known through *Nasik Inscription* built by Gautamiputra Satkarni's mother Gautami Balashri after his death).
- According to the Junagadh Inscription of Rudradaman, he was defeated by Kardamaka ruler *Rudradaman I*.
- He practiced *Endogamy* (marriage in the same clan).

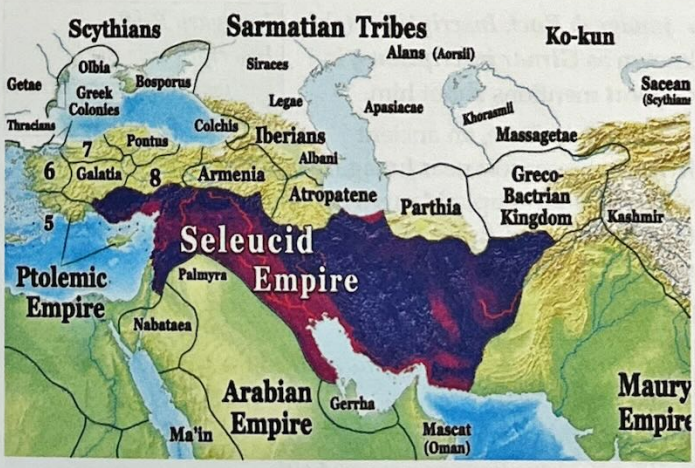
Architecture

- Many Chaityas, Viharas were cut out from rocks, **E.g.** ***Bhaja,Kanheri and Karle Caves*** (all in Maharashtra).
- *Ajanta Caves* were first to be built during their reign.
- ***Stupas built:*** Amravati and Nagarjunakonda (Andhra Pradesh).
- They developed the *Amravati School of Art* (deep and complex carvings).

Chedi Dynasty

- *Ruler:* *King Kharavela* (Associated with the Hathigumpha inscription).
- *Region:* *Kalinga*
- *Time period:* 1st century BCE.

INVASIONS FROM CENTRAL ASIA (2ND CENTURY BC ONWARDS)



- Around 200 BCE, though no empire matched the Mauryas in size, the period was crucial for growing Indo-Central Asian contacts. It saw Invasions from multiple tribes located in the region west of China till Iran.

Causes of Invasion

1. Building of the Great Wall of China.
2. Weakening of the Seleucid Empire.

Mlecchas meaning: Outsiders

Indo Greeks

- Greeks were the first to cross Hindu Kush mountain.
- *Bactrians* are also known as *Indo-Greeks*.
- *Most famous ruler: Meander/Milinda* (converted to Buddhism) → Dialogue between *Milinda* and *Nagasena* (a Buddhist monk) written in *Milindapanho*.
- Menander had his capital as: Sialkot.
- They were the *first* to introduce *Gold coins*.
- They were first to introduce coins that were *attributed to the King* (coins had picture of the King).
- The Indo Greek king *Demetrius* issued coins with bilingual inscription.
- They introduced *Hellenistic art* (seen in *Gandhara Art*) in North Western region.

SAKAS

- Sakas were also known as *Western Kshatrapas*
- They ruled in North-West and North India.
- They were also known as *Scythians*.
- They divided themselves into *5 branches*: One of the branches settled over Western part of India that ruled until *4th Century AD* (300 AD-400 AD).
- The were defeated by *Yueh-chis* (Tribal group) before entering India.

Saka calendar: The Indian national calendar, also called the Shaka calendar or Śaka calendar, is a solar calendar that is used alongside the Gregorian Calendar by the Gazette of India.

Rudradaman I (130 AD-150AD)

- He was the *most famous* Saka ruler.
- *Junagarh Rock Inscriptions* (also known as *Girnar inscriptions*) in *Gujarat* mentions about him.

Junagarh Rock Inscription is the earliest rock inscription in Sanskrit language.

- *Sudarshan Lake,* an ancient irrigation reservoir near Junagarh, Gujarat, was built under Chandragupta Maurya by Governor *Pushyagupta,* then repaired by Ashoka's governor *Tushaspha*, and later restored by *Rudradaman I* and *Skandagupta*.

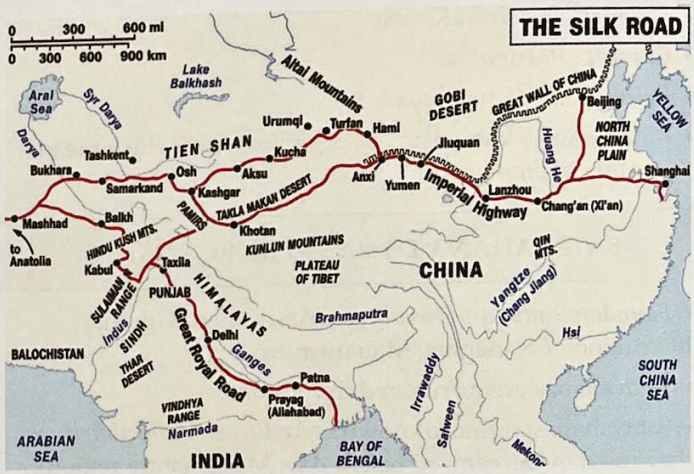
Vikramaditya Parmar

- *In 57 BC defeated Sakas (this marked the beginning of Vikram Samvat).*
- *He was the ruler of Ujjain.*
- *Vikramaditya became a coveted title.*

Note: *Parthians* also came to Indian subcontinent after Sakas. *St. Thomas* (disciple of Jesus) is said to have visited during *Gondophernes (Indo-Parthian King)*.

KUSHANS (1ST CENTURY AD -3RD CENTURY AD)

- They were also known as *Yuezhis/Tocharians*.
- *Capital: Purushpura (Peshawar)* (first) → Later: *Mathura*.
- They called themselves *Devaputra* i.e., *"Sons of Gods/ King of Kings"* (It shows Divinity of King).
- Sculptures of rulers of *Kushans* have been discovered at *Mathura*.
- Kushans were the first kings to issue the largest hoard of Gold coins.
- *First Dynasty: Kadphises*
  - *Rulers:*
    - *1. Kujula Kadphises* (1st ruler)
    - *2. Vima Kadphises* (2nd ruler)
    - *3. Kanishka* (son of Vima Kadphises)



- The Kushans held significant power over the Silk Road, facilitating trade between *China*, *India*, and the *Roman Empire*.

Kanishka (127 AD - 150 AD)

- Kanishka was the *4th ruler* in his dynasty.
- He started the *Saka Era* (followed by *Govt. of India*) in 78 AD when he ascended the throne.
- *Started: Purest form of Gold coins*.
- He is also known as *2nd Ashoka*.
- He patronised *4th Buddhist Council*.
- We get to know about him from *Rabatak Inscriptions* (Found in *Afghanistan*) which dates back to *2nd Century CE*, written in *Bactrian language*.

Impact on Indian Society

- They completely immersed themselves in indigenous culture (as warriors or Kshatriyas).

- ***Pottery:*** *Red Ware*
- Horseman technique, Turban wearing, and Sherwani wearing were introduced.

Polity

- ***Introduced:*** *Satrap system* of Government (Satraps were called as "Strategos" (Military General) by *Greeks*.

> ***Under Satrap system kingdom was divided into provinces, each under military governor "Mahakshatrapa" and the governors of lower status were called "Kshatrapas".***

Culture

- They worshipped *Shiva* and *Lord Buddha*.

Literature

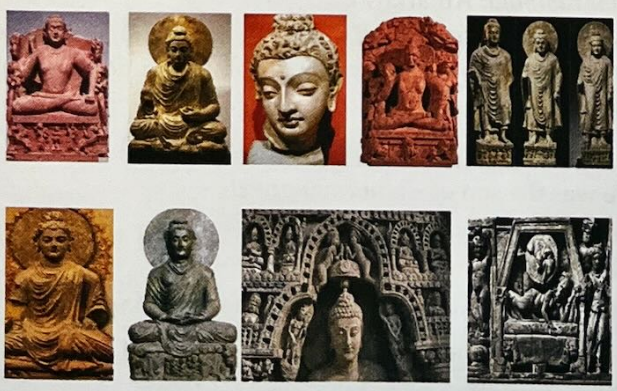
- *Buddhacharita: Ashvaghosha*
- *Mahavatsu and Divyadana*
- *Kamasutra: Vatsyayana*

Science

- ***Medicine:*** *Charaksamhita* (A book that mentions about different medicines) by *Charak* (Father of Medicine).
- *Agnivesha Tantra:* An Ancient, lost Ayurvedic text. (3rd-2nd century BC)
- *Sushruta:* Father of Surgery.

Gandhara School of Art vs Mathura School of Art

Gandhara School of Art	*Mathura School of Art*
Introduced by Kushan Dynasty	It is an indigenous art that was later developed by Kushans
It is a hellenistic style of Buddhist visual art.	It deals with imagery subjects from Hinduism + Jainism + Buddhism
Great detailing	Buddha's images are largely carved in Abhay mudra
Half closed eyes	Eyes are open
Halo behind Buddha's idol is not well developed	Halo is well developed
Grey sandstone is used for art	Red sandstone is used for art



Gandhara School of Art and Mathura School of Art

GUPTA DYNASTY (320 AD - 543 AD)

- ***Founder:*** *Sri Gupta* (Son: *Ghatotkach*)
- Guptas ruled over *Madhyadesha* (Uttar Pradesh + Madhya Pradesh + Bihar).
- They are considered to be feudatories of *Kushans*.
- Sanskrit was promoted as the official language.
- The Gupta age in ancient India has been called the *"Golden Age of India"* because of the many achievements in the field of arts, science, and literature that Indians made under the Guptas.

Chandragupta I (319 AD - 335 AD)

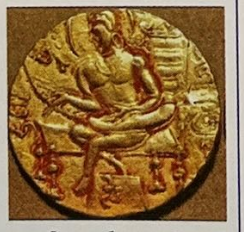
- ***Title:*** *Maharajadhiraja*
- ***Married to:*** Kumaradevi *(Lichchavi Princess)*
- He started Gupta Era in *320 AD/319 AD*.
- Gold coins introduced by him were called *Dinars*.

Samudragupta (335 AD - 375 AD)

- He was the most powerful and greatest king of the dynasty.
- He was a devotee of lord *Vishnu* and performed *Ashwamedha Yagya*.
- Record of his reign is mentioned in *Prayag Prasasti* {Allahabad Pillar Inscription → Composed by *Harisena* (his court poet)}.
- Samudragupta is considered to have remained *undefeated* in battles.
- He is titled *"Napoleon of India"* by *V. A. Smith*.
- ***Other titles taken:*** *Param Bhagavat, Sarva-raj-ochchetta* (uprooter of all king), *Lichchavi* and *Kaviraja*.
- He has been shown *playing Veena on coins*.
- Samudragupta granted permission to *Meghavarman*, the Buddhist king of *Ceylon (Sri Lanka)* to build a monastery in *Bodh Gaya*.

Chandragupta II (380 AD - 415 AD)

- He achieved power by assassinating his brother *Ramgupta* and *Saka* invader.
- He married his brother's wife *Dhruvadevi*.
- He formed matrimonial alliance by marrying off his daughter *Prabhavati Gupta* with Vakataka Prince *Rudrasena II*.

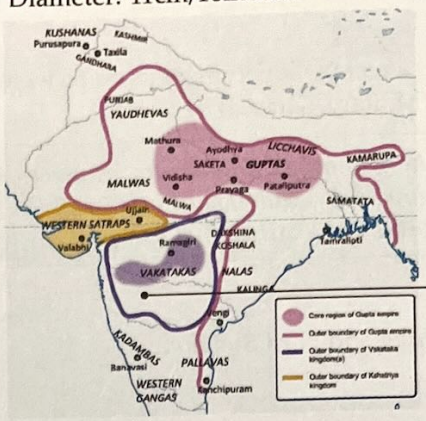


Samudragupta shown playing Veena on gold coin

- He was the first Gupta to introduce *Silver coins* after the victory over Saka ruler Rudrasimha III (this is mentioned in *Mehrauli* Iron Pillar in Delhi).
- He took the title *Vikramaditya after defeating Sakas*.

Mehrauli Iron Pillar:

- Height: 7.2 m/23feet 8inches
- Diameter: 41cm/16inches



Indirectly ruled by guptas after death of Rudrasena II (his wife ascended the throne)

- His court was adorned with nine *Navratnas*. They were:

Amarasimha	Lexicographer
Dhanvantri	Physician
Ghatakarpara	Poet
Kalidasa	Shakespeare of India
Shanku	Architect
Varahamihira	Astronomer
Vararuchi	Grammarian, Sanskrit Scholar
Vetala Bhatta	Scholar & Brahmanical theologian.
Kshapanaka	Astrologer

- He was visited by *Fa-Hein*, the *first Chinese traveller* during his reign.

Books

- ***Kalidasa:*** Abhigyan Shakuntalam, Malvikagnimitra, Raghuvamsa, Meghaduta, Kumar Sambhavam, Ritusamhara
- ***Vetala Bhatta:*** Niti Pradipa, Mantrashastra
- ***Vishakhadatta:*** Mudrarakshasa (about Chandra Gupta Maurya) and Devichandraguptam (about Ramagupta and Chandragupta II
- ***Aryabhatta:*** Surya Siddhanta
- ***Varahamihira:*** Pancha-Siddhantika (6th century AD)
- ***Amarasimha:*** Amarkosh
- ***Sudraka:*** *Mrichchhakatika* (5th Century AD), It is a love story of *Charudatta* and vasantasena (also known as: the *little clay art*).

Kumaragupta I (415 AD - 455 AD)

- He was the son of *Chandragupta II*.
- His empire was attacked by Huns.
- He founded *Nalanda University*.
- He is associated with the Mehrauli Iron Pillar.

Skandagupta I (455 AD - 467 AD)

- He successfully resisted the attack of *Huns*.
- ***Title taken:*** Vikramaditya (Source: *Bhitari Pillar Inscription* location in the Gazipur district of Uttar Pradesh).

- He also repaired *Sudarshan lake*.
- He moved his capital to *Saketa* and renamed it *Ayodhya* after the legendary city in the Ramayana.

Administration → *Decentralised*

Empire → *Bhuktis* (under the charge of Uparika)

Divided into districts

↓

Vishayas (under the charge of Vishaya Patis)

↓

Vithis (under the charge of Nagarpati)

↓

Villages (under the charge of Gramika)

Tirabhukti was a major administrative province (bhukti) in the Gupta Empire, corresponding to modern-day North Bihar and the Tirhut region.
Whereas Bundelkhand region was known as Jejabhukti.

Important Officers

Kumarmatyas	Provincial Officer (most important Officer)
Mahadanda Nayaka	Officer responsible for punishment (Minister of Justice)
Sandhivigrahika	The officer of war and peace
Nagara Shresthi	Chief Banker of the city

Harisena held all these posts except Nagara Shresthi

During the Gupta period, Chatta and Bhatta (or Chata-Bhata) referred to the lower-ranking military and police personnel, specifically denoting regular (standing army) and irregular (temporary/mercenary) troops, respectively.

Adhisthana Adhikarana

- Adhisthana Adhikarana was an administrative/judicial division which acted as *local court*, *revenue office* and *administrative supervisory body*.
- It was mentioned in Gupta period inscription especially the *Damodarpur Copper plates* from Bengal (5th- 6th century AD)

Officers in Adhisthana Adhikarana

- *Vishayapati:* Head of District
- *Kumaramatya:* High ranking officer
- *Rajasthaniya:* Royal representatives of kings
- *Ayukta:* General Administrative officer
- *Sresthin:* Representative of merchant guilds/ traders
- *Sarthavaha:* Caravan leader
- *Prathama kulika:* Chief artisan
- *Lekhaka or Pustapala:* Record keeping official
- *Dutaka:* Messenger
- *Prathama kayastha:* Scribe

Taxes

Bhaga	1/6th of the produce to be paid by cultivators
Bhoga	Periodic supplies of fruit, flowers to the King
Bali	Oppressive
Uparikara	Extra tax
Vishti	Form of forced labour
Halivarika	To be paid by one who owned a plough
Udakabhaga	Tax on water
Hirayana	Tax for special purpose
Udranga	A type of Land tax
Chikara	An Emergency tax

The land of the Gupta period was majorly categorized into the following groups:
Kshetra - Cultivable land.
Khila - Wasteland.
Aprahata - Jungle or forest land.
Vasti - Habitable land and Gapata
Sarah - Pastureland.

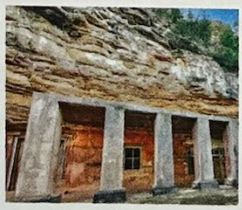
Culture

Idol of Varah

- **Built by:** Chandragupta II
- **Avatar** of Lord Vishnu
- **Place:** Udaygiri, Vidisha, Madhya Pradesh

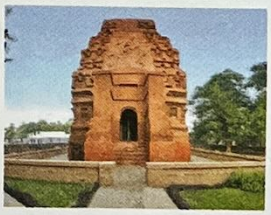
Dashavatara Temple (Lord Vishnu)

- Place: Deogarh, Lalitpur, Uttar Pradesh



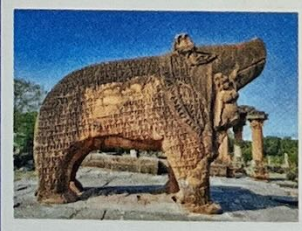
Bagh Cave, Madhya Pradesh

- Famous for ancient mural paintings
- Buddhist Caves



Bhitargaon Temple (UP)

- Dedicated to Lord Krishna
- It is also known as Brick Temple (one of the oldest)



Eran Pillar Inscription

- Location: Eran, Sagar District (MP)
- Date: 510 CE
- It mentions Bhanugupta and provides the earliest epigraphic evidence of the Sati practice (widow immolation).

Reason of Decline of Guptas:

- The invasion of the Hunas weakened Gupta power.
- Later, *Yashodharman* of Malwa defeated the *Hunas* and also challenged Gupta authority, further diminishing their strength.
- Provincial governors and feudatories declared independence, leading to political disintegration.

VAKATAKA DYNASTY

- **Founder:** *Vindhyashakti*
- **Capital:** *Nandivardhana*, *Pravarapura*
- **Greatest ruler:** *Pravarasena* (only Vakataka ruler to use the title "*Samrat*")
- They were feudatories of *Satavahanas*.
- They were the contemporaries of *Guptas*.
- They followed *Brahmanism* but also patronised *Buddhism*.
- They ruled in the Central and Southern part of India.
- In Puranas, they have been mentioned as *Vindhyakas*.

Ajanta caves

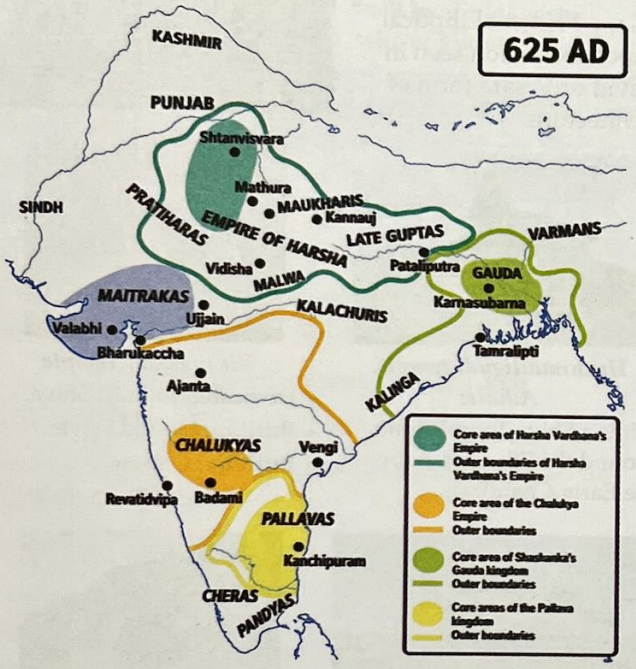
- ***Location:*** *Sambhajinagar, Maharashtra*.
- ***Build time :*** *2nd BC - 6th AD*
- ***Total:*** *29 caves* (4 - Chaitya and 25 - Vihara).
- Added to the UNESCO world heritage site in *1983*.
- These are Buddhist caves built during *Satavahanas* and *Vakatakas* (Harisena).

- *Total Puranas: 18*
- *Written by: Sage Vyasa*
- *Compiled in: 3rd-10th Century AD*

PUSHYABHUTI/VARDHANA DYNASTY

- *Founder:* *Pushyabhuti*
- They were ruling in *Thaneshwar* (now in Haryana).
- *Son:* *Prabhakarvardhan*

  Prabhakarvardhan had two sons and a daughter:
  - *Rajyavardhana* (eldest)
  - *Harshavardhana* (youngest)
  - *Rajyashri* (daughter) who married *Grahavarman* (he was a member of the Maukhari Dynasty, ruling at kannauj).
  - Grahavarman was killed by the combined armies of *Devgupta* (Ruler of Malwa) and *Shashanka* (Ruler of Gauda). Subsequently, Rajyavardhana was also killed. Harshvardhana took revenge by defeating the Gauda King Shashanka.



Harshavardhana (606 AD-647 AD)

- *Capital:* *Kannauj*
- *Defeated:* *Dhruvasena II* (ruler of *Maitraka Dynasty* and then married his daughter to him to secure the western boundary).
- He was a *shaivite* and patronised *Buddhist* religion.
- *He authored 3 books:* *Ratnavali*, *Nagananda*, and *Priyadarshika*.
- Biography of Harshavardhana *"Harshacharitra"* written by his court poet *Banabhatta* (he also wrote: *Kadambari*).
- *"Sakalottarapathanatha"* title given to Harshvardhana which means Lord of North India (mentioned in Chalukyan inscription).
- He was defeated by *Pulakeshin II* (Chalukyan king) on the banks of Narmada river (*Battle of Narmada* in 618 AD).
- His administrative empire was divided into two parts: directly *administered territories* and *feudatory states*.
- *Arunashva* (Governor under Harsha) ruled after Harsha but could not establish a dynasty.

Hiuen-Tsang/Xuang-Zang:

- *2nd Chinese* Traveller (1400 years ago)
- He stayed in India for about 15 years.
- He traveled extensively under the patronage of Emperor *Harshavardhana*.
- His writings, *"Si-yu-ki" (Records of the Western World)*, provide invaluable insights into Indian society, religion, education, and administration.

Assemblies

- *Kannauj:* To honour Hiuen -Tsang
- *Prayag:* Organised every 5 years at the confluence of Ganga, Yamuna, and Saraswati.
- Known as the origin of the Kumbh tradition (first historical evidence of Kumbh Mela).

Inscription

- *Banskhera inscription:* it is a 7th-century CE (628 CE) *copper plate* grant issued by Harshavardhana, discovered in *Shahjahanpur*, Uttar Pradesh. It has Harshavardhan's *personal signature*.
- *Madhuban copper plate inscription & Sonpat inscription* - are also *epigraphical sources* about Harsha's reign.
- Harshavardhan's *Vallabhi conquest* is found in - *Navsari copper plate Inscription*.

Maukhari Dynasty

- *Ishanvarman, an important ruler of Maukhari Dynasty took title of Maharajadhiraja.*

Ikshvaku Dynasty

- *Founder:* *Chintamula 1*
- *Time period:* 3rd - 4th century CE
- *Capital:* *Vijayapuri* (identified with Nagarjunkonda).
- *Region:* Lower Krishna - Guntur valley (modern Andhra Pradesh).

Vishnukundin Dynasty

- *Capital:* Amarapuram or Amravati

CHALUKYA DYNASTY

- Chalukya Dynasty rulers were feudatories of *Kadambas of Banavasi*.
- They were divided into three distinct dynasties:
  - *Badami Chalukya* (Early Chalukya) → Capital: Vatapi
  - *Eastern Chalukya* → Capital: Vengi
  - *Western Chalukya* (Later Chalukya) → Capital: Kalyani

BADAMI CHALUKYA

Jayasimha

- He was the first ruler of this dynasty.
- ***Capital:*** *Vatapi*

Pulakeshin I (543 AD-566 AD)

- He was the founder of *Badami Chalukya Dynasty*.
- ***Pulakeshin I had two son:*** *Kirtivarman I* and *Mangalesha* (Mangalesh was killed by Kirtivarman I's son *Pulakeshin II*, who later ascended the throne).

Pulakeshin II (610 AD-642 AD)

- He is considered the *greatest ruler* of this dynasty.
- After defeating Harshavardhana, *Pulakeshin II* took the title of *"Dakshinapatheshwara"* (Lord of South).
- ***Titles of Pulakeshin II:*** Satyashraya, Bhattaraka, Maharajadhiraja, Parameshwara, Prithvivallabha
- He also defeated *Mahendravarman I* (Pallava ruler) in the *Battle of Pullalur*.
- He was defeated in the *Battle of Vatapi* (642 CE) by *Narasimhavarman I* (son of Mahendravarman I), who then assumed the title "*Vatapikonda*" (Conqueror of Vatapi).
- *Aihole Pillar Inscription* (Karnataka) was about Pulakeshin II, composed by his court poet *Ravikirti*.

Vikramaditya I

- He was the third son of Pulakeshin II
- He recovered *Vatapi* from Pallavas.
- His great grandson *Kirtivarman II (last ruler of Badami Chalukya)* was defeated by *Dantidurga* who later founded Rashtrakuta Dynasty.

Vinayaditya → Vijayaditya → Vikramaditya II → Kirtivarman II		
↑	Attacked 3 times on Pallavas	(Great Grandson) (Defeated by Rashtrakutas)
Vikramaditya I		

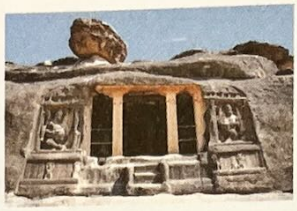
Chalukyan Architecture

Chalukyan Temple architecture is divided into three groups:

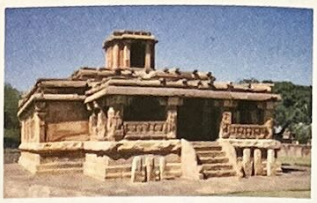
- *Aihole:* Known as Laboratory of Indian Temple Architecture.
- *Badami:* Famous for rock-cut cave temples.
- *Pattadakal:* Blend of Nagara (North Indian) and Dravida (South Indian) styles.

Note: Aihole, Badami and Pattadakal are located in *Karnataka*.

Aihole group of temples



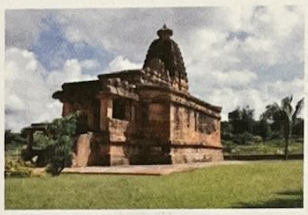
Ravana Phadi Caves



Lad Khan Temple
Dedicated to Shiva

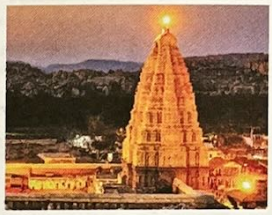
Durga Temple

- Example of **Gaja-Prishta** form of architecture
- Originally dedicated to God '*Surya*'
- Located in '*Bagalkot*', Karnataka, Known for its unique apical design.
- *Gaja-Prishta:* Elliptical shaped formation seen in Dravid or Vesara form of Architecture.



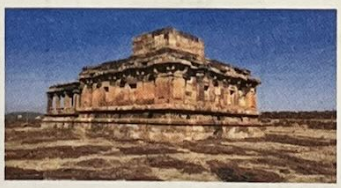
Huchimalligudi temple, Aihole:

- It is a Shiva Temple built around the 7th century by the Early Chalukyas.



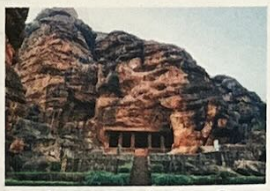
Virupaksha Temple

- Dedicated to Lord Shiva.
- **Built in:** Dravida style.
- **Built by:** *Queen Lokamahadevi*



Meguti Jain Temple

- Only Jain temple at Aihole.
- Contains the *Aihole inscription* of *Ravikirti*.



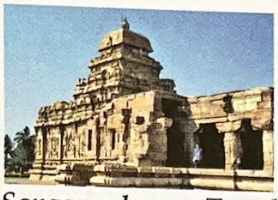
Badami Rock Cut Caves
Four major rock-cut caves carved into sandstone cliffs showcasing Shaiva, Vaishnava, and Jain traditions side by side.

Pattadakal group of temple

- A total of 10 temples seen here: 4 (Nagara style) and 6 (Dravida style).
- Declared as *UNESCO World Heritage Site* in *1987*.
- Pattadakal group of temples are known as *"Cradle of Indian Architecture"*.

Papanatha temple

- It is based on Mixed architecture style: Nagara+Dravid
- It is a part of Pattadakal group of Temple.



Sangameshwara Temple

- **Built in:** Dravida style.
- **Dedicated to:** Lord Shiva.

Galaganatha Temple
Built in: Nagara style.

Mallikarjuna temple

- **Built by:** *Trilokadevi* (wife of Vikramaditya 2).

PALLAVA DYNASTY (575 AD-897 AD)

- **Founder:** *Simha Vishnu*
- **Capital:** *Kanchipuram*
- Pallavas were feudatories to *Kalabhras*.
- They developed the Dravida architecture temples.
- **Greatest ruler:** Mahendravarman I

Mahendravarman I (600 AD - 630 AD)

- Patron of Rock-cut Architecture.
- Initially Mahendravarman was Jain then converted to Hinduism (Shaivaites).
- Son: Narasimhavarman 1.

Narasimhavarman I (630 AD - 668 AD)

- **Title taken:** *Mahamalla* and *Vatapikonda*.
- He started the *Monolithic Rock* cut temple.
- He founded the *port city Mahabalipuram*.

Last ruler: *Aparajitavarman* defeated by Chola king *Aditya I* in 897 AD.

Pallava Architecture

Shore temple, Mahabalipuram

- Added to UNESCO World Heritage Site in *1984*.
- **Dedicated to:** Lord Shiva.
- **Built by:** *Narasimhavarman II* (known as: Rajasimha, known for: Structured Stone temples).
- Located at *Mahabalipuram* facing towards Bay of Bengal in the Coromandal Coast.

Kailasanathar temple

- **Built by:** *Narasimhavarman II*
- Made up of Granite Rock.
- Dedicated to Shiva.
- *Narsimhavarman II* started standing Rock cut Architecture.

Seven Ratha temple, Mahabalipuram, Tamil Nadu

- **Built by:** *Narasimhavarman I.*
- These temples are also known as *Pancha Rathas* or *Pandava Rathas*.
- Called *Seven Pagoda* by "*Marco Polo*"
- Each ratha has a distinct plan, showcasing architectural diversity:

1. **Draupadi Ratha** → Simple hut-like shrine.
2. **Arjuna Ratha** → Square-plan shrine.
3. **Bhima Ratha** → Elongated hall (mandapa type).
4. **Dharmaraja Ratha** → Multi-storeyed vimana.
5. **Nakula–Sahadeva Ratha** → Apsidal (semi-circular) plan.

RASHTRAKUTA DYNASTY (755 AD - 982 AD)

- **Capital:** *Manyakheta* (Modern day Malkhed, Karnataka).
- Known for their military strength, patronage of literature, and support of Jainism and Shaivism.

Dantidurga (735 AD - 756 AD)

- Founded the Rashtrakuta dynasty by overthrowing the Chalukyas of Badami.
- **Assumed titles:** *Prithvivallabha*, *Rajadhiraj*.
- *Sanjan Plates* **(Copper-plate inscription of Dantidurga):** Records victories over Kalinga, Malava, Lata, Tanka, Koshala, and the Gurjara king Nagabhata I.
- Performed the *Hiranyagarbha* Mahadana ritual at Ujjain to assert *Kshatriya* status.
- Defeated *Kirtivarman II*, the last ruler of the Badami Chalukyas.

Krishna I (756 AD - 774 AD)

- He was the successor and paternal uncle of Dantidurga.
- Patron of Shaivism.
- Continued military campaigns against Chalukyas and Pallavas.
- Constructed *Kailashnatha temple* at Ellora.
- *Aurangzeb*, the Mughal Emperor, once attempted to destroy the temple.

Govinda II

- Son of Krishna I, weak ruler, short reign, no significant conquests.

Dhruva Dharavarsha (780 AD - 793 AD)

- He expanded Rashtrakuta power into North India and initiated their role in the *Tripartite Struggle*.
- Dhruv Dharavarsha Defeated:
  - *Vatsaraja* (Gurjara-Pratihara ruler)
  - *Dharmapala* (Pala ruler)
  - *Pallavas* in the south

Govinda III (793 AD - 814 AD)

- Son of Dhruva Dharavarsha.
- **Title Assumed:** *Sarvabhauma* (Universal Monarch).
- He defeated *Pratihara king Nagabhatta II* and *Dharmapala* of Pala dynasty.
- Considered the most aggressive Rashtrakuta ruler during the Tripartite Struggle.
- Inscriptions claim victories over Gurjaras, Andhra Pradesh, Kerala and even Lanka.
- He conquered *Himalaya* to *Kaveri*.

Amoghavarsha I (814 AD - 878 AD)

- Son of Govinda III and great grandson of Krishna 1 .
- **Real name:** *Sarva* (before coronation).
- **Assumed title:** "*Nripatunga*".
- He converted to Jainism and patronised Jainism.
- Patron of literature and grammar
- He was disciple of *Acharya Jinasena*, who authored the *Adi Purana* during his reign.
- *Saktayana*, grammarian in his court, composed *Amoghavritti* (Sanskrit grammar).
- Amoghavarsha himself authored: *Kavirajamarga* (earliest known Kannada literary work) and *Prashnottara Ratnamalika* (in Sanskrit).
- Referred to as "*Ashoka of the South*" for his non-violent policies and Jain influence.

Krishna II

- Faced stiff resistance from *Eastern Chalukyas* and *Cholas*.
- Could not expand the empire like his predecessors and saw stagnation in territorial expansion.

Indra III (914 AD - 928 AD)

- Briefly restored Rashtrakuta supremacy by occupying Kannauj during the Tripartite Struggle, defeating Pratihara *Mahipala I*.
- **Assumed titles:** *Ratta Kandarpa* (meaning "Rashtrakuta Cupid") and *Nityovarsha* (symbolizing prosperity).
- Described by *Arab traveler Al-Masudi* in his book *Muraj ul-Zuhab* (Book of Golden Meadows).

Govinda IV

- His reign marks the beginning of the decline of the Rashtrakuta empire.

Amoghavarsha II

- Short and insignificant reign, overshadowed by internal conflicts.

Krishna III (939 AD - 967 AD)

- Considered the last great Rashtrakuta ruler .
- Successfully invaded the Chola territory and captured *Tanjore* (Thanjavur) by defeating Chola king *Prantaka I* in the *Battle of Tokkolam* in 949 AD.
- Took the grand imperial **title:** *Akhilakshtrakuta Chakravartin* (Universal Emperor of all Rashtrakutas).
- Defeated *Eastern Chalukyas*, maintaining supremacy in the Deccan.
- At the peak of his reign, controlled territory from *Gujarat* to *Tanjore*.

Khottiga (967 AD - 972 AD)

- Also Known as *Karka II*.
- Karka II Defeated by *Tailopa II* who established Later Chalukya.
- Faced attack from Paramara ruler *Siyaka II*, who sacked the Rashtrakuta capital Manyakheta, marking the start of Rashtrakuta decline.
- This attack significantly weakened the dynasty. Manyakheta was destroyed, marking a symbolic end of Rashtrakuta power.

Indra IV (973 AD - 982 AD)

- Last Rashtrakuta Ruler.
- Committed *Sallekhana*, the Jain ritual of voluntary death by *fasting*.
- Power passed to the Western Chalukyas of Kalyani, under Tailapa II.
- Tailapa II was once a feudatory of the Rashtrakutas and founded a new dynasty , Chalukyas of Kalyani .

Architecture

- *Ellora caves*
- **Location:** *Sambhajinagar, Maharashtra*.
- **Build time:** 6th - 11th century AD.
- Total *34 caves*.
- **Cave 1 - 12:** Associated to *Buddhism* (Patronised by Kalachuris and Early Chalukya).
- **Cave 13 - 29:** Associated to *Hinduism* (Patronised by Rashtrakutas).
- **Cave 30 - 34:** Associated to *Digambar Jainism* (Patronised by Rashtrakutas).

Kailasha Temple at Ellora (Dedicated to Lord Shiva).

- **Built by** *Krishna I*
- World's *largest Monolithic* Rock Cut Temple.
- Present at *16th* Ellora cave.
- Added to UNESCO World Heritage site in *1983* along with Ajanta - Ellora caves.

Elephanta Caves

- **Build time:** 5th- 7th century AD.
- Total *7 caves*.
- Built by *Rashtrakutas* and later *Kalachuri Dynasty*.
- Three - head idol of Shiva (*Trimurti*) can be seen here.
- Added to UNESCO world heritage in *1987*.

Dashavatara Temple

- **Dedicated to:** Lord Vishnu.
- It is studied as a bridge between Gupta art and post-Gupta temple culture.

Dynasties that emerged after the Rashtrakutas and Their Regional Influence

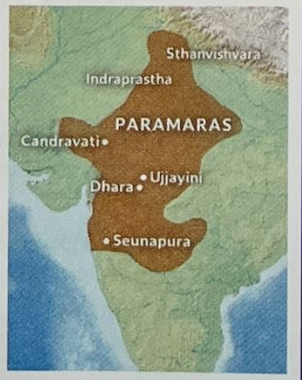
Dynasty	Region	Relation to Rashtrakutas
Western Chalukyas (Kalyani)	Karnataka	Direct successors
Paramaras	Malwa	Former Feudatories
Kalachuris (Tripuri)	Madhya Pradesh	Regional beneficiaries
Yadavas (Seuna)	Maharashtra	Former Feudatories
Eastern Chalukyas	Andhra Pradesh	Strengthened & Expanded due to vacuum
Cholas	Tamil Nadu	

Chalukyas of Kalyani (Later Chalukyas)

Aspects	Details
Period	973-1189 CE
Founder	Tailapa II
Capital	Kalyani
Famous Ruler	Vikramaditya VI
Architecture	Gadag style
Successors	Hoysalas

Parmar Dynasty

Aspects	Details
Region	Malwa
Capital	Dhara
Famous Ruler	Raja Bhoja
Architecture	Malwa Nagara style
Origin	Ex-feudatories of Rashtrakutas



- Statue of *Raja Bhoja*, a legendary Indian king from the 11th century.
- **Location:** The 32-foot-high bronze statue is located at the Upper Lake in *Bhopal*, Madhya Pradesh, India.
- Raja Bhoja wrote a book *"Sarasvatikanthabharana"*
- *Bhojatal Lake* of Bhopal provides 40% water supply.
- Paramaras were devotees of Shiva.

Kalachuri Dynasty

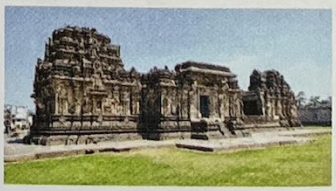
Aspects	Details
Capital	Tripuri (MP)
Period	9th-12th CE
Religion	Shaivism
Architecture	Central Indian Nagara
Key Ruler	Lakshmikarna
Famous Region	Amarkantak

Hoysala Dynasty

- They were feudatory to *Chalukyas of Kalyani*
- Capital: *Dwarasamudra (Halebidu)*
- Founder: *Nripa Kama II*

Aspects	Details
Period	10th-14th CE
Capital	Belur / Halebidu
Greatest Ruler	Vishnuvardhana
Architecture	Stellate soapstone temples
Architecture	Gadag style
Successors	Vijayanagara Empire

Architecture



Lakkundi Temple (Vesara style)
- Developed during later Chalukyas (Kalyani)

Somnathpura Temple (Karnataka)
- ***Built by:*** Hoysala Dynasty

Chennakeshava Temple (Belur, Karnataka)

- Star-shaped temple.
- ***Built by:*** *King Vishnuvardhana.*
- Style of architecture: *Bhumija style* of architecture.
- ***Dedicated to:*** Lord Vishnu.
- Chenna means '*Beautiful*' and Keshava means '*Vishnu*'.
- Built in *soapstone* (chloritic schist)

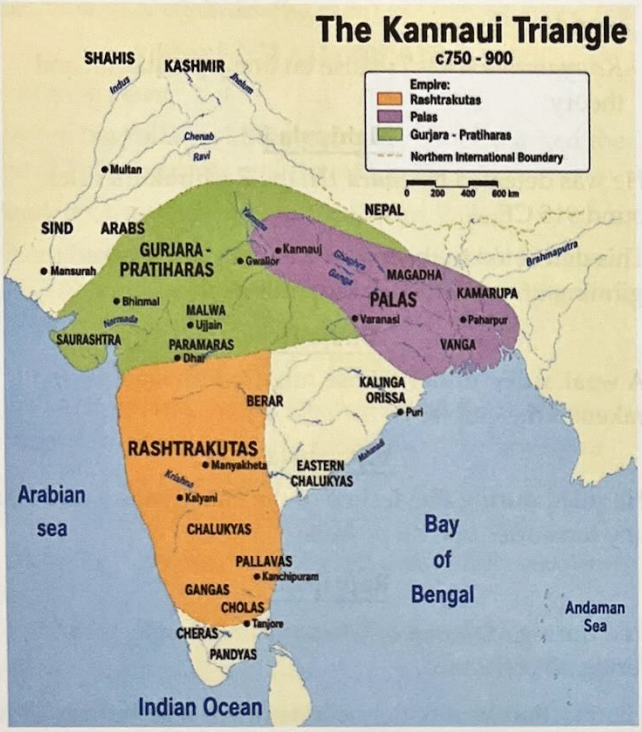
Hoysaleswara Temple (Halebidu, Karnataka)

- *42nd UNESCO World Heritage* site
- ***Dedicated to:*** Lord Shiva
- *3 Jain Basadis* are within the complex.

Pulakeshin II defeated Harshavardhana	
Pulakeshin II defeated Mahendravarman I	
Narsimhavarman I defeated Pulakesin II	

Tripartite Struggle

- A prolonged political and military conflict between 8th - 10th CE to control Kannauj, a symbol of imperial legitimacy in North India.
- It is also known as *Kannauj Triangle War*.
- Fought among three powerful dynasties:
  1. *Palas:* East India **(Bengal region)**.
  2. *Pratiharas:* West and Central India **(Rajasthan, MP, Gujarat)**.
  3. *Rashtrakutas:* Deccan **(Maharashtra and Karnataka)**.



PALA DYNASTY

- **Founder:** *Gopala*
- They were followers of *Mahayana Buddhism*.
- **Rulers:** Gopala → Dharmapala → Devapala → Mahipala → Ramapala.

Gopala (750 AD - 770 AD)

- Elected by local leaders to end anarchy in Bengal.
- He was founder of *Odantapuri University*.

Dharmapala (770 AD - 810 AD)

- Most expansionist Pala rulers.
- **Title:** *Paramsaugat*.
- Founded *Vikramashila University* (famous for Vajrayana or Tantrik Buddhism studies (Bhagalpur, *Bihar*)) & *Sompura University*.
- He defeated *Indrayudh* and conquered Kannauj for a brief time and established Chakrayudh as puppet ruler.
- After winning Kannauj, he assumed the title "*Uttarapath Swami*" (Lord of the North).
- He was defeated by *Dhruva Dharavarsha* (Rashtrakuta king) in a battle near Munger, Bihar.
- Fought against *Vatsaraja* (Pratiharas) and *Govinda III* (Rashtrakuta).

Devapala (810 AD - 850 AD)

- He expanded the Pala Empire to its greatest extent, conquering Assam, Odisha, and parts of the Deccan.
- Sent Buddhist missions to Sri Lanka, Burma, and Java.
- Strengthened the Pala navy for overseas missions and coastal control.
- Continued patronage of Nalanda and Vikramashila universities.
- The *Shailendra king Balaputradeva* (from Srivijaya, Southeast Asia) requested and received grants for a monastery at *Nalanda* from Devapala.
- Devapala granted land revenue from 5 villages for this monastery.
- Notable Buddhist monks during his reign: *Dipankar Atisha* came from Tibet, studied at Vikramashila and Nalanda , *Dharmasvami* - Another respected monk active during this period.

Mahipala I (988 AD - 1038 AD)

- He revived the Pala dynasty after decline, recovering northern and eastern Bengal and Bihar.
- Mentioned in the *Kalhana's Rajatarangini* (written in *Sanskrit* language in 12th century AD).

Successors

Nayapala → Vigrahapala III → Mahipala II → Ramapala

- The period of decline began.
- Faced attacks from the *Kalachuri* and *Sena dynasties*.
- Among them, Ramapala was the last notable ruler who tried to revive the empire.

Madana Pala

- Defeated by *Vijayasena* of the Sena dynasty.
- His defeat marked the end of Pala rule in Bengal.

Sena Dynasty

- **Founder:** *Hemanta Sena* (c. 1095 AD).
- **Real Founder:** *Vijaysena*.
- **Capital:** *Vijayapura*.
- Highly Centralised Monarchy.
- The Sena Dynasty ruled Bengal after the Pala dynasty (11th-12th century AD).
- During Sena Dynasty rule *Jaydeva* wrote *Gita Govinda*.
- They revived Brahmanism (orthodox Hinduism) in Bengal.
- **Rulers:** Ballala Sena, Lakshman Sena.
- Ballala Sena introduced '*Kulinism*'.
- His successor, Vijaya Sena, reigned for over 60 years, solidifying the dynasty's control.

- *Dhakeshwari Temple* in Dhaka was built in the 12th century CE by King *Ballala Sen*.
- In 1204 *Bakhtiyar Khilji* attacked *Lakshman sena* and ended the Sena Dynasty.

GURJARA PRATIHARA

Nagabhatta I (730 AD - 760 AD)

- *Capital: Kannauj/Bhinmal*
- Founder of the dynasty.
- Defeated Arab forces in Rajasthan (Battle near Broach) in the 8th century.

Agnikul Theory related to Gurjar Pratihars is written in the Prithviraj Raso.

Vatsaraja

- First Pratihara king to enter the *Tripartite Struggle* for Kannauj.
- Faced defeat by *Dharmapala (Pala king)*.

Nagabhatta II

- He recovered Kannauj.
- He defeated *Dharmapala* but was defeated by *Govinda III* (Rashtrakuta ruler).

Ramabhadra

- Son of Nagabhata II (a weak ruler, short reign).

Mihir Bhoja or Bhoja I (836 AD - 885 AD)

- *Most powerful ruler* of the Gurjara-Pratihara dynasty.
- He extended the empire from Gujarat to Bengal.
- **Adopted divine title:** *Adivaraha* (Boar incarnation of Vishnu).
- Coins issued with Varaha Image (boar symbol).
- Described by Arab travelers (like *Sulaiman*) as: "*Enemy of Islam*" and one of the four great kings of the world in their view.

Gwalior Inscription:

- Record defeat of *Govinda III's* army at *Sagar Tal* (though Rashtrakutas claim the opposite).
- Proclaims Bhoja's power and victory in *Madhya Bharat*.
- Defeated Devapala (Pala ruler) in battle. Reasserted Pratihara supremacy in the Kannauj region.

Mahendrapala (885 AD - 910 AD)

- Son of Mihira Bhoja.
- Successfully maintained the strength and prosperity of the Pratihara empire.
- Ruled over a vast territory from Punjab to Bengal.
- Launched a *military campaign* against *Kashmir*: Fought with *Shankaravarman* (Karkota ruler of Kashmir) and was defeated in the campaign.
- His court became a major center of Sanskrit learning and literature.
- He patronized *Rajashekhara*, a celebrated Sanskrit poet and dramatist, often called the "*Kalidasa of the Pratiharas*."
- Under Mahendrapala's patronage, Rajashekhara composed several important works:
  - *Karpuramanjari*– Prakrit play (the only known Prakrit drama of that time).
  - *Viddhasalabhanjika*– Sanskrit drama.
  - *Bal Ramayana*– Condensed version of the Ramayana.
  - *Bal Mahabharata*– Condensed version of the Mahabharata.
  - *Harivilasa*– Epic work on Lord Krishna.
  - *Bhuvanakosha*– Descriptive geography of the known world.
  - *Kavyamimamsa*– Treatise on literary criticism and theory.

Mahipala I

- He was defeated by *Indra III*, the Rashtrakuta ruler, around 915 CE.
- This defeat led to the loss of Kannauj and marked the beginning of the Pratihara Empire's decline.

Bhoja II

- A weak ruler, under whose reign internal conflicts weakened the empire

Vijayapala

- He ruled during the decline of the Pala dynasty and lost many territories to rival powers.

Rajyapala

- Led during *Mahmud of Ghazni's* invasion in 1018 CE, offering no resistance.
- His inaction was widely condemned, and he was later killed by the Chandela ruler *Vidyadhara* for capitulating to Mahmud.

Trilochanapala

- He ruled during the collapse of the Pratihara state.

End of Dynasty

- The Pratiharas lost power due to *external invasions*, and *internal fragmentation* among feudatories.
- Their decline marked the end of the Tripartite Struggle (Pratiharas–Palas–Rashtrakutas) for control of Kannauj.

CHOLA DYNASTY (850 AD - 1280 AD)

- **Founder:** *Vijayalaya Chola*
- **Initial capital:** *Uraiyur*
- They were feudatories to *Pallavas*.
- **Region:** Tamil Nadu, parts of Andhra Pradesh, Kerala, Sri Lanka, and Southeast Asia.
- **Religion:** Primarily *Shaivism* (Lord Shiva worship), but tolerant toward other faiths.

Note: *Do not get confused between the early Cholas that ruled during Sangam Age (3rd Century BC-3rd Century AD) and later Cholas, who ruled between 9th and 13th Century AD.*

- **Known For:** Strong naval power, magnificent temple architecture (*Dravidian style*), and an efficient local self -administrative system.
- **Most Powerful ruler:** *Rajendra Chola*.

Vijayalaya Chola (850 AD - 871 AD)

- He captured *Thanjavur* (Tanjore) from the *Muttaraiyars* (chiefs of the Kaveri delta) and this marked the firm establishment of Chola rule in South India.
- He built a temple dedicated to goddess *Nishumbhasudini* (a form of Durga) at Thanjavur.
- **Title:** *Narkesari* (Lion among men).

Aditya I (871 AD - 907 AD)

- Son of Vijayalaya.
- Defeated the Pallavas king *Aparajita*, which marked the decline of Pallava power and rise of Cholas.
- Extended Chola influence in the Kaveri Valley.
- After conquering the *Madurai* and *Tirunelveli* (Pandya Mandalam) regions, he assumed the title "*Maduraikonda*" (Conqueror of Madurai).

Prantaka I (907 AD-955 AD)

- He lost to Rashtrakuta king *Krishna III* (in the Battle of Takkolam) who made a *Victory Pillar* and *Krishneshwara temple* at *Rameshwaram*.
- The *Uttaramerur inscription* mentions Parantaka I.
- He defeated Pandyas at Vellore and temporarily occupied Sri Lanka.
- Assumed the **title:** "*Maduraiyum Elamum Konda*" (Conqueror of Madurai and Lanka).
- **Issued coins called:** *Kasu* (small denomination) and *Kalanju* (gold coin).

Raja Raja I (985 AD-1014AD)

- He was the *real founder* of Chola imperialism.
- He defeated *Cheras* at *Trivandrum* and conquered *Madurai* from *Pandyas*.
- He conquered *Maldives* and invaded *Sri Lanka*.
- Permitted the *Shailendra king* (from Srivijaya dynasty, Southeast Asia) to construct a Buddhist temple Monastery at *Nagapattinam* called *Chudamani Vihara* (Symbol of diplomatic and religious tolerance).
- Introduced a land revenue system, organized departments like *PWD*.

Rajendra I (1014 AD-1044 AD)

- He was the son of *Raja Raja I*.
- He is also known as *"Napoleon of South India"*.
- Launched naval expeditions to Sri Lanka, Burma, the Andaman Islands, and Srivijaya (Southeast Asia).
- He completely conquered *Sri Lankan (Ceylon)* capital *Anuradhapura*.

Mahmud of Ghazanavi was a contemporary of Rajaraja I and Rajendra I.

- He crossed Ganga and defeated two local Kings of Bengal and took the title *"Gangaikondachola"* and built the city *Gangaikondacholapuram* as the new capital.
- He built *Chola Gangam Lake* (Ponneri lake), situated within the vicinity of Gangaikonda Cholapuram to celebrate his northern campaign.
- Sent an army to Ganga, brought *Ganga water* in a golden pot.
- Conquered Andhra, Odisha, and Bengal and took the chola empire to its peak.

Successors

Rajadhiraja I → Rajendra II → Virarajendra

- Continued imperial dominance.
- Faced resistance from Western Chalukyas and Pandya

Kulottunga I

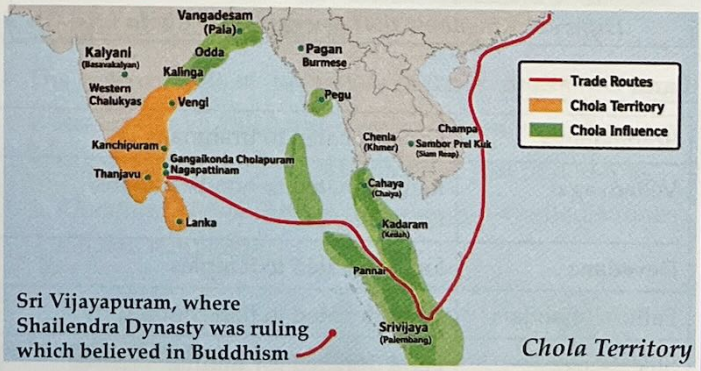
- United Chola and Eastern Chalukya lineages.
- Focused more on administration and consolidation rather than aggressive expansion.
- Promoted trade with Southeast Asia and China

Later Cholas (Kulottunga II - Rajendra III)

- Gradual decline of power.
- Chola fought against the *Western Chalukyas (Kalyani)*.
- The final blow came with defeat by *Pandyas* in the 13th century.

Aftermath:

- *Later Cholas* were replaced by *Pandyas* and *Hoysalas* in Tamil Nadu and Karnataka.
- *Later Chalukyas* were replaced by *Yadavas* (Devagiri) and *Kakatiyas* (Warangal) in the Deccan.



Administration

- The king of Chola Dynasty has all the authority.
- He had Council of Ministers to advice him.
- Chola Empire was divided into: *Mandalams* (province) which was further divided into *Valandu* (districts) → *Nadus* (sub-districts) → *Kurram* (group of villages) → *Ur* (village).

Chola Government

- Cholas are known for local (*decentralised*)/village government.

• *Uttaramerur inscriptions* describe a well-organized village administration.

- Every village was divided into *30 yards (kudumbus)*.
- Each yard was governed by a local committee called "*Variyam*"

• There were two assemblies:

- ***Ur:*** Assembly of *common people*.
- ***Sabha:*** Assembly of *learned Brahmins* (Agrahars: Land of Brahmins).

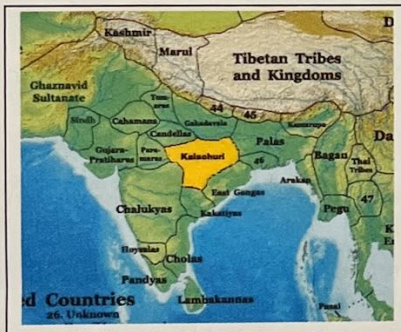
• The village assembly (Sabha) functioned through specialized committees:

- **Eri Variyam** → Tank & irrigation management.
- **Tottavariyam** → Gardens.
- **Pon Variyam** → Gold & finance.
- **Nyaya Variyam** → Justice.

• Members of committees were selected through the *Kudavolai system* (lottery method), famously described in the Uttaramerur inscriptions (Chingleput,Tamil Nadu).

• People with property or land were privileged to take part in elections.

• Every member of the committee was appointed for *3 years*.



Different Kingdoms that emerged after Chola rule

Yadava Dynasty

• *Capital: Devagiri*

Hoysala Dynasty

• *Capital: Halebidu*

• Famous for *star-shaped temple*.

Kakatiyas

• *Capital: Warangal*

Land Donations

Brahmadeya	Land donated to Brahmans
Vellanvagai	Land donated to non-Brahmans/ Peasants
Devadana	Land donated to temples
Pallichchhandam	Land donated to Jain community
Shalabhoga	Land donated for maintenance of school

Tax

• There were two types of taxes governed by Chola Empire: *Vetti* (forced labour) and *Kadamai* (land revenue tax).

Great Living Chola Temples

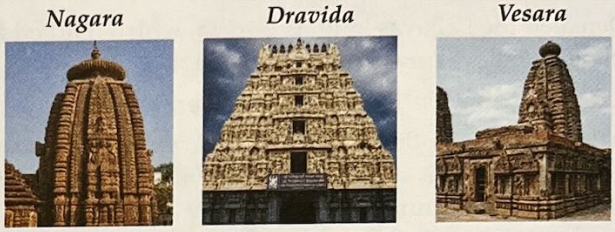
• All the temples under this category are listed in *UNESCO World Heritage Site*.

• Famous for being constructed using the *interlocking stone method* (stones were locked without mortar).

• *Brihadeeshwara Temple* (an engineering marvel of its time) is built at:

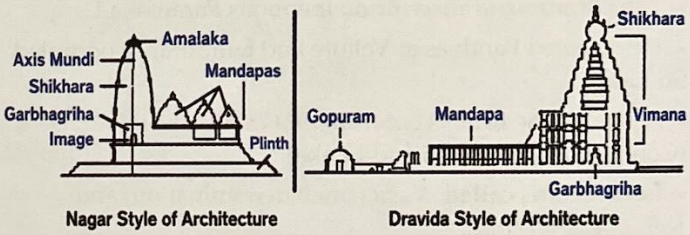
- *Tanjore*, by *Raja Raja I* (also known as *Rajarajeshwara Temple*) (UNESCO Heritage site: 1987).
  - The capstone (or Kumbam/Kumbam) on the sri *vimana* (main tower) of the Brihadeeshwara Temple at Tanjore, Tamil Nadu, is a massive, monolithic piece of granite weighing approximately *81 tons*.
- *Gangaikonda Cholapuram* at *Tamil Nadu*, by *Rajendra I* (UNESCO Heritage site: 2004).

Temple Architecture



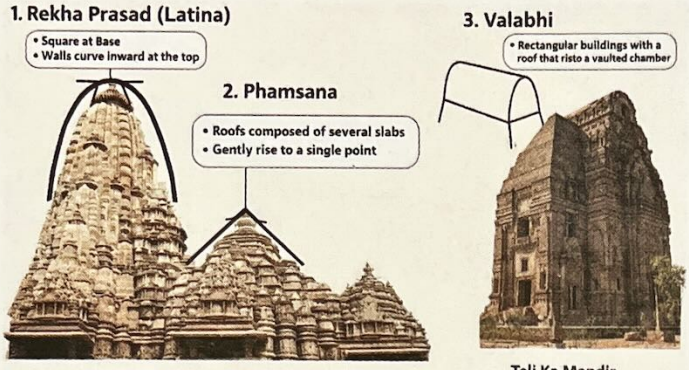
Different Temple Architectures

• *Nagara style* (in *North India*), *Dravida style* (In *South India*), and *Vesara style* (a mixture of *Nagara* and *Dravida style*).



Nagar Style of Architecture **Dravida Style of Architecture**

Nagara Style	*Dravida Style*
It is commonly found in: Northern and Central regions of India	It is commonly found in Southern India
Main shrine: Shikhara which is curvilinear or conical in shape	Main shrine: Vimana
Gopuram (main entrance) is not present here	Gopuram is present here
Mandapa (pillared hall) is connected to Sanctum and features a pyramidal or conical roof.	Mandapa is connected to Sanctum and has flat-roofed assembly hall.
Nandi is placed inside the temple. Chief deity is installed at Garbhagriha (Sanctum Sanctorum)	Nandi is placed outside the temple. Chief deity is installed at Garbhagriha.
A water tank or reservoir may or may not be present.	The temples consists of large water reservoirs or temple tanks inside temple complex.
They are primarily built on square raised stone platform (jagati) in Panchayatan style.	They are made on an apsidal plane (elliptical in shape) known as Gaja Pristha.



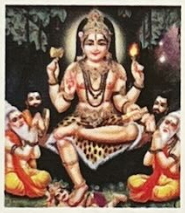
Lakshmana Temple, Khajuraho (10th cent)

Teli Ka Mandir, Gwalior (8th cent)

Three types of Shikhara (Nagara Style Temples)

Brihadeeshwara Temple (Tanjore)

Shiva temple (Gangaikonda Cholapuram)



- *Dakshinmurti Shiva Portrait* was found at Brihadeshwar Temple.
- The person under Shiva's feet is "*Apasmara*" known as Demon of Ignorance and Ego.

Note: In early mid 11th century, the Chola king Rajendra I seized *Sun-pedestal* from the *Chalukyas*, a *Ganesha* statue and several statues of *Durga*; a *Nandi* statue from the *Eastern Chalukyas*; an image of *Bhairava* (a form of Shiva) and *Bhairavi* from the *Kalinga of Orissa*; and a *Kali* statue from the *Palas of Bengal* and added it in Brihadeeshwara temple of Thanjavur.

Airavatesvara Temple

- **Location:** Darasuram (near Kumbakonam, Tamil Nadu)
- **Built by:** *Rajaraja II*
- **Design:** Temple in chariot
- Added to UNESCO site in *2004*.

Some Other Temples

Kandariya Mahadeva Temple (Madhya Pradesh)

- ***Built by:*** *Chandela Dynasty* rulers.
- This temple is a part of *Khajuraho temples*.
- Walls of this temple depict the Kamasutra of *Vatsyayana*.

Dancing figure of Shiva (the "King of Dance")

- Natraj performing *Tandava*.
- The figurine is made of Bronze using *lost-wax casting technique (Cire perdue)*.
- Standing on the *right leg*.

The Cholas were known for their splendid Bronze sculptures made through Lost Wax Technique.

Other Architecture of Various Dynasties

Dilwara Jain Temple

- *Location: Mount Abu, Rajasthan*
- *Built by: Vastupala brothers*
- *Style: Maru Gurjara style* (developed by Solankis → Feudatories of Chalukyas in Western India).

Modhera Sun Temple (Modhera, Gujarat)

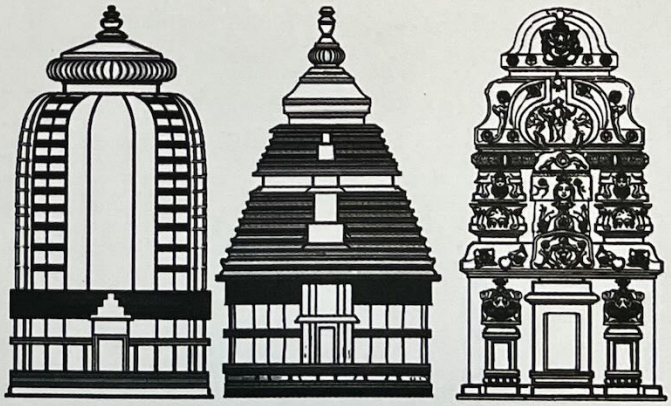
- ***Built by:*** *King Bhimadeva I* of Solanki Dynasty.
- ***Style:*** *Maru Gurjara style*.

Somnath Temple (Gujarat)

- ***Style:*** *Maru Gurjara style.*

Kalinga Architecture (Odisha)

- The style consists of three distinct types of temples:
  1. *Rekha Deula:* Tall curvilinear tower (sanctum).
  2. *Pidha Deula:* Pyramid-like stepped hall (mandapa).
  3. *Khakhara Deula:* Rectangular, wagon-vaulted shrines (Shakta temples).

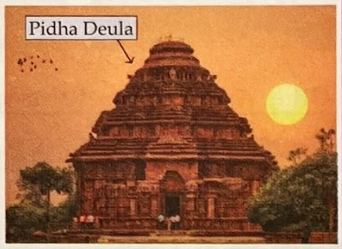


Rekha Deula **Pidha Deula** **Khakhara Deula**

Examples of Kalinga Architecture

Vaital Deula (Bhubaneswar): A distinct example of the Khakhara Deula type, defined by its semicircular or barrel-vaulted roof (shaped like a long, inverted boat or pumpkin).

Konark Sun Temple (Odisha)



- It is also known as *Black Pagoda*
- ***Built by:*** *Narasingha Deva I* (Eastern Ganga Dynasty)
- ***Style:*** Nagara + Kalinga style (Pidha Deula).
- It is seen in *₹10 note*.
- It features 24 intricately carved stone wheels (12 pairs). These wheels, which are approximately 12 feet in diameter, are located on the sides of the temple, which is designed in the shape of a colossal chariot. The 24 wheels are believed to represent the 24 hours of a day, and the 7 horses pulling the chariot symbolize the days of the week.

Lingaraj Temple (Odisha)

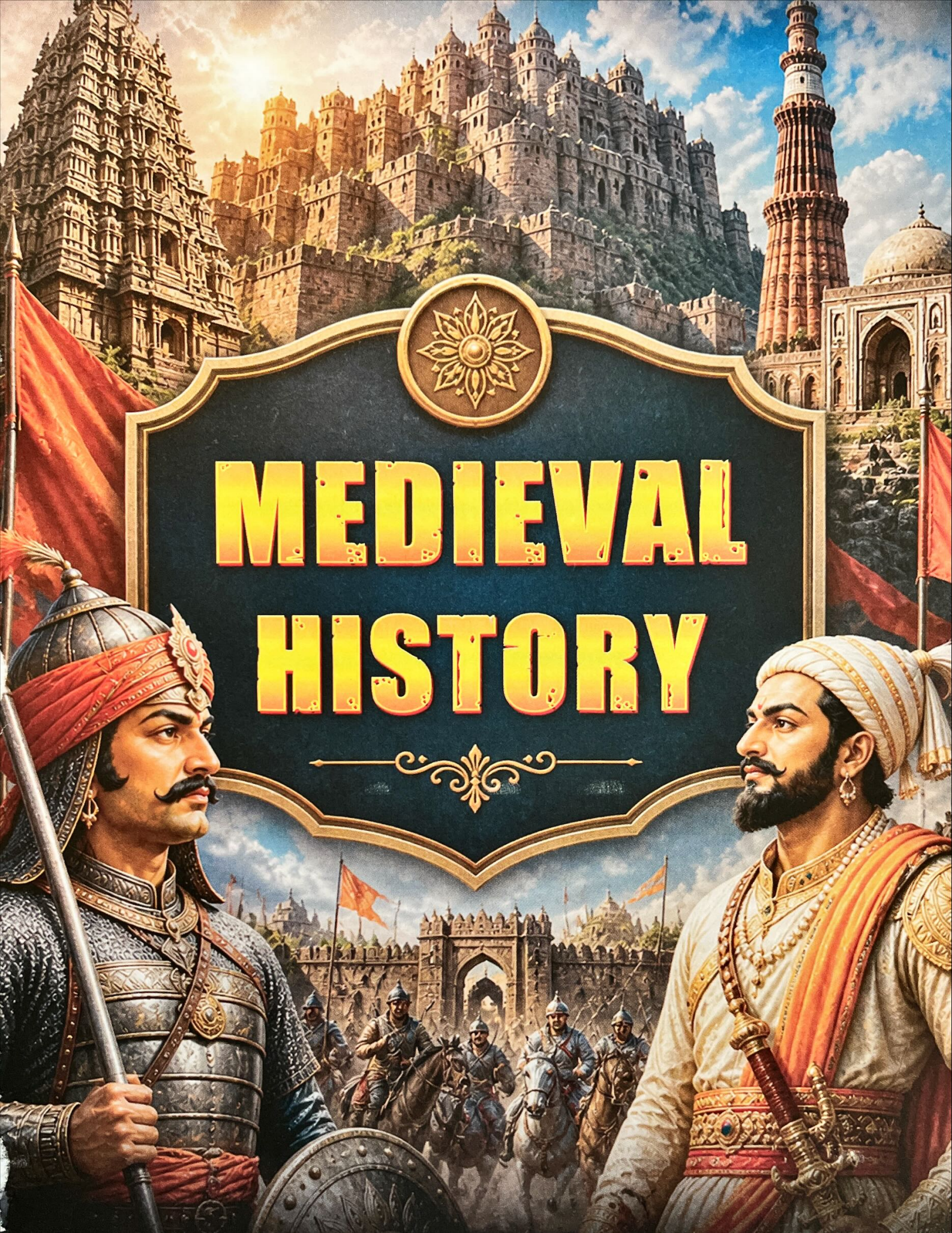
- **Built by:** *Jajati* or *Yayati* Keshari of *Somavamsi* Dynasty
- Example of *Rekha Deul* and *Pidha Deul*.
- Pidha Deul is also known as Jagmohan means Mandapa.

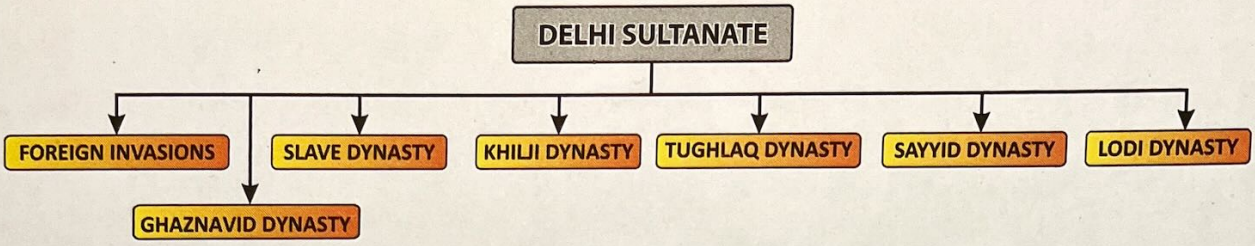
Jagannath Puri Temple (Puri, Odisha)

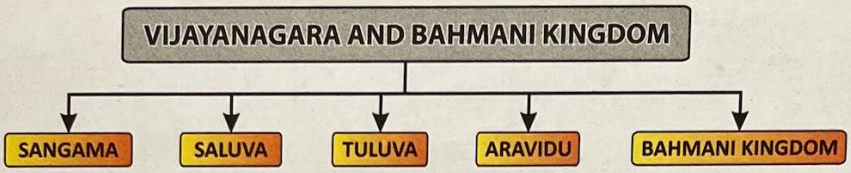
- This temple is also known as *White Pagoda*.
- ***Style:*** *Rekha Deula* style
- ***Built by:*** *Anantavarman Chodaganga Deva* (Eastern Ganga Dynasty).

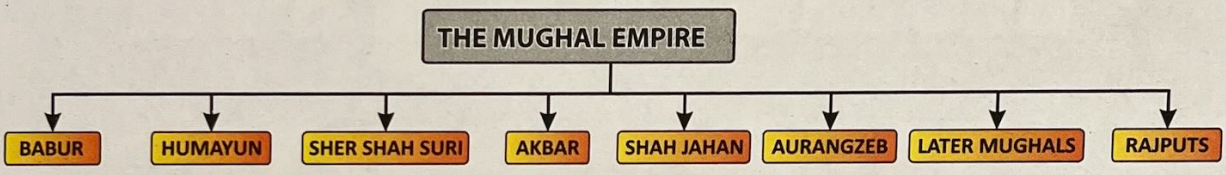
Mukteshvara Temple (Odisha)

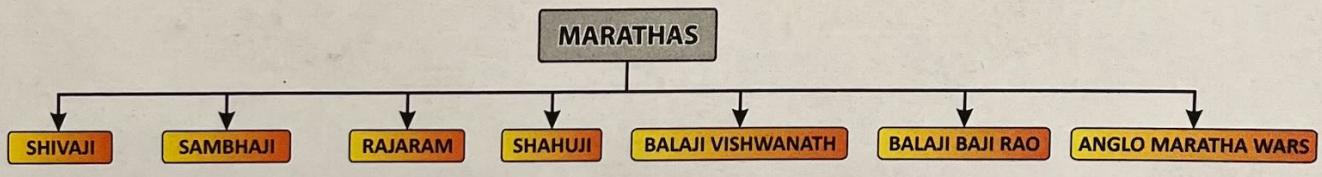
- ***Dynasty:*** Somavamsis
- ***Style:*** Kalinga (Rekha + Pidha Deula)
- Dedicated to Lord Shiva

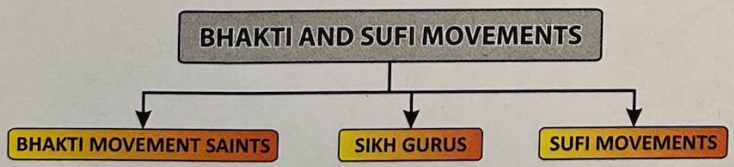

MEDIEVAL
HISTORY


DELHI SULTANATE
FOREIGN INVASIONS
SLAVE DYNASTY
KHILJI DYNASTY
TUGHLAQ DYNASTY
SAYYID DYNASTY
LODI DYNASTY
GHAZNAVID DYNASTY


VIJAYANAGARA AND BAHMANI KINGDOM
SANGAMA
SALUVA
TULUVA
ARAVIDU
BAHMANI KINGDOM


THE MUGHAL EMPIRE
BABUR
HUMAYUN
SHER SHAH SURI
AKBAR
SHAH JAHAN
AURANGZEB
LATER MUGHALS
RAJPUTS


MARATHAS
SHIVAJI
SAMBHAJI
RAJARAM
SHAHUJI
BALAJI VISHWANATH
BALAJI BAJI RAO
ANGLO MARATHA WARS


BHAKTI AND SUFI MOVEMENTS
BHAKTI MOVEMENT SAINTS
SIKH GURUS
SUFI MOVEMENTS

INVASION OF ISLAM

- Islam originated around 610 AD in the 7th Century AD.
- The Middle East (green part of the map) was the centre of Islam.
- ***Khalifa:*** The Uppermost Islamist Ruler.
- ***Umayyad*** (a Khalifa) was ruling there in the name of "***Prophet Muhammad***" in 9th CE.
- The region in Green Colour was under Direct rule of the "***Abbasids***".
- ***Transoxania and Khorasan*** (Orange Coloured part of the map) originally belonged to "Turks".
- Islamic rulers used to hire Slaves from Samarkand region (Present day Uzbekistan) and convert them to Islam then eventually set them to higher position to become rulers.
- The Abbasid Empire disintegrated around the 10th century and Independent Kingdoms emerged.
- ***Manshur:*** A formal letter issued by Khalifa to Sultans (ruler) to rule over a certain region.

Dynasties that Ruled Transoxania and Khorasan Region

- Islamic rule brought the ***Umayyads and Abbasids***. It was followed by independent Persian/Turkic dynasties.
- **Samanids** (819-999 AD)
- **Ghaznavids** (977 AD-1186 AD)
- **Seljukids**
- **Khwarazmian**
- **Mongols** (founded by ***Genghis Khan***)
- **Timurids** (founded by ***Timur***)

JAICHAND: Mujhe Kyu Toda?

GHAZNAVID DYNASTY

- ***Alap-Tigin*** (a Turk slave) initially captured Ghaznavid region, but it was Sabuktigin, his son-in-law who later set an independent dynasty (the real founder).
- Sabuktigin and his son, Mahmud of Ghaznavi / Ghazni captured ***Zabulistan and Kabulistan region*** of Afghanistan from Hindu Shahi Rulers in the late 10 Century AD.
- ***Jayapala*** of Hindu Shahi Dynasty (Peshawar Region) was defeated by Sabuktigin.
- Mahmud of Ghaznavi attacked ***Waihind/Udabhandapura*** (a strong base of Hindu Shahi rulers after Peshawar) in ***999 AD.***

Foreign Invasions

Muhammad Bin Qasim → 1st Islamic Invasion (712 AD)

- This invasion took place in Sindh part of India.
- He came from Arab and killed ***Raja Dahir*** (last Hindu ruler of Sindh).
- He was the first to introduce ***jizya*** in Indian subcontinent.

Mahmud of Ghazni → 2nd Islamic/1st Turk Invasion (998 AD-1030 AD)

Court language of Turks was Persian.

- Turks came from ***Turkmenistan.***
- He attacked ***17 times*** (1001 AD-1027 AD).
- ***Battle of Peshawar (1001 AD):*** It took place between ***Mahmud of Ghazni*** (it was his first attack) and the Hindu Shahi ruler ***Jayapala (defeated)***, near Peshawar.
- Jayapala committed suicide called '***Funeral Pyre***' in which King and his followers accept Death.
- ***Battle of Waihind or Chaach (1008 AD):*** A series of conflicts between Ghazni and Anandapal, Son of Jayapala. In this Battle, Ghaznavi captured the fort of Bhimnagar and Nagarkot (Present in Pakistan) which marked the entry of Ghaznavid Empire into Lahore, Taxila and Punjab region.
- ***Attack on Somnatha Temple (1025 AD):*** Ghazni invaded ***Somnath*** in his ***16th attack*** and it was his last major expedition outside Punjab.

Reason behind Victory of Turks:

- Iqta System
- Excellent Breed of Horses
- ***"Spirit of Ghazi"*** which means that non-muslims are Kafirs and Islam has to eliminate them to capture their lands.

Expeditions of Mahmud of Ghazni in India

- **Attacked Mathura in 1015 AD:** ***Defeated Kokalla II*** of Kalachuri Dynasty who gave strong resistance to Ghazni.
- Ghazni plundered Mathura.
- **Attacked Kannauj:** ***Rajyapala,*** Gurjar-Pratihara Ruler of Kannauj gave no resistance to Ghazni and fled from Kannauj.
- Rajyapala was replaced by ***Trilochanpala.***
- Ghazni again attacked in 1019 and defeated Trilochanpala of Kannauj.
- When Ghazni again attacked in ***1021 AD***, he faced a strong resistance from Chandela Ruler Vidhyadhar with a strong army.

Final Attack of Ghazni

- Following the Somnath Raid, the ***Jats/ Khokhars*** attacked his returning army, prompting Mahmud to launch a final punitive naval campaign against them in 1027 AD, near the Indus River.
- ***Death: 1030 AD.***

Writers during the reign of Mahmud of Ghazni

Writers	Writings
Firdausi	*Shahnama*
Al Biruni	*Tahqiq-i-Hind* (also known as *Kitab-al-Hind*)

- *Ferishta* was a historian of the 17th Century CE wrote about history of Islamic rule in India.
- *Al-Utbi* was a Persian historian and court chronicler during the reign of Mahmud of Ghazni. He is best known for his work *Kitab al-Yamini*.

RAJPUT RULERS

- *Chauhans* of Shakambhari were ruling over **Rajasthan Region**.
- *Solankis* were ruling over **Gujarat region**.
- *Parmars* were ruling over **Malwa Region**.
- *Tomars* were ruling over **Delhi**.
- *Chandelas* were ruling in **Mahoba** and **Khajuraho Region**.
- *Anangpal Tomar* founded the *Tomara Dynasty*. Delhi first became a capital under their rule only.
- Vigraharaja (a Chauhan Ruler) captured Chittorgarh and then Delhi from Tomars (1151 AD).
- He allowed Tomars to rule over Delhi as feudatories.

Prithviraj Chauhan

- *Prithviraj III or Prithviraj Chauhan* ascended the throne at the age of 11 in 1171 AD.

Expeditions of Prithviraj Chauhan :

- Prithviraj invaded *Jejakabhukti (Bundelkhand)*, defeating the Chandela king Paramardi and sacking the capital, Mahoba.
- He launched a campaign against the Chalukyas (Solankis) of Gujarat, ruled by Bhima II which later ended in a Peace Treaty.
- Prithviraj had strained relations with Jaichand of Kannauj.
- *Prithviraj Raso (a Brajbhasha epic poem)*, written by Chand Bardai mentions the abduction of *Samyukta*, daughter of Jaichand by Prithviraj.

Muhammad Ghori → 3rd Islamic/2nd Turk Invasion (1175 AD-1206 AD)

- *Persian name: Mu'izz al-Din Muhammad.*
- He was the Younger brother of Ghiyasuddin Muhammad (Ghurid Empire).
- He conquered Peshawar from the Ghaznavid Empire (the ruler of Ghaznavid Empire was Khusrau Malik).
- *His first attack took place in: 1175 AD* (in Multan) and *1178 AD (Battle of Anhilwara)* in Gujarat, where he was defeated by *Mularaja II, Bhima II* and their mother *Naiki Devi*.

Jai Chand is said to have invited Md. Ghori to attack Prithviraj Chauhan.

- Captured *Tabarhinda fort* of *Bhatinda* in 1191 but later got defeated by Prithviraj Chauhan in *1st Battle of Tarain (1191 AD)* & later defeated Prithviraj in *2nd Battle of Tarain (1192 AD)*.
- *Qutb-ud-din Aibak* (commander of Ghori) helped him in 2nd Battle of Tarain.

Battle of Chandawar (1194 AD)

- This battle was fought between *Ghori* and *Raja Jaichand*, where Ghori won the battle.
- Following this battle, Ghori conquered Kannauj in 1198 AD and captured *Fort of Asni*.

Understanding the Base

- *Slaves of Ghori: Qutb-ud-din-Aibak, Yalduz, Kubacha.*
- Muhammad Ghori was killed by the Khokhar Tribe in 1206 AD.
- *Yalduz* **(Slave of Ghori)** took over Ghazni.
- *Multan* and *Uchch region* was administered by Kubacha **(Slave of Ghori)**
- Lahore was under the rule of Qutub-ud-din Aibak.

Bakhtiyar Khilji

- He was *not a slave of Ghori* but came to India with him.
- Initially he took governorship under Rajput rulers and gradually, he consolidated his power in the region.
- He *destroyed Nalanda* and *Vikramashila University*.
- *Conquered Odantpuri Fort* (a Buddhist vihara) of Bihar in 1193 CE and occupied Lakhnauti region in Bengal in 1204 CE.
- During Assam Expedition to occupy Tibet, Bakhtiyar Khilji was assassinated by his own Military General *Ali Mardan Khan* at *Devkot* in 1206 CE.
- After Ali Mardan, Ghiyasuddin Iwaz succeeded the throne who accepted the suzerainty of Iltutmish.
- *Malik Jani* was appointed as Governor of Bihar by Iltutmish.

• Finally in 1227 CE *Nasiruddin Mahmud* (Son of Iltutmish) invaded Bengal and Bihar by defeating Ghiyasuddin Iwaz.

DELHI SULTANATE PERIOD (1206 AD -1526 AD)

DYNASTIES

TRICK TO REMEMBER → *Sab Khatarnak The Saare Log*

- *Slave Dynasty (1206 AD - 1290 AD) → S (Sab)*
- *Khilji Dynasty (1290 AD - 1320 AD) → K (Khatarnak)*
- *Tughlaq Dynasty (1320 AD -1414 AD) → T (The)*
- *Sayyid Dynasty (1414 AD - 1451 AD) → Sa (Saare)*
- *Lodhi Dynasty (1451 AD - 1526 AD) → Lo (Log)*

SLAVE DYNASTY (1206 AD-1290 AD)

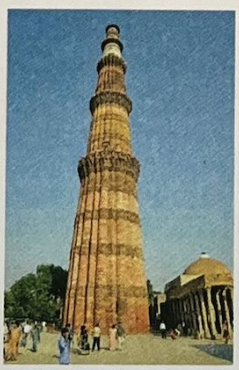
- This dynasty is also known as *Mamluk Dynasty*.
- The rulers belonged to *Ilbari tribe/Shamsi tribe*.
- **Rulers of Slave Dynasty:**

1. Qutb-ud-Din Aibak
2. Aram Shah
3. Iltutmish
4. Rukn-ud-din Feroze
5. Razia al-Din (Razia Sultana)
6. Muiz-ud-din Bahram
7. Ala-ud-din Masud
8. Nasiruddin Mahmud
9. Ghiyas-ud-din Balban
10. Muiz-ud-din Muhammad Qaiqabad

Qutb-ud-din Aibak (1206 AD-1210 AD)

- He ruled from Lahore (it was the capital city).
- He was given the title of *'Lakh Baksh'* (the giver of Lakhs).
- *Death: 1210 AD*, while playing *Chaugan* (now known as *Polo*).
- *Architecture constructed by him:*
  - *Mosques: Quwwat-ul-Islam* at Delhi and *Adhai din ka Jhonpra* at Ajmer.
  - He also began construction of *Qutub Minar* (he was only able to complete the construction of basement), in honour of *Sufi Saint Khwaja Qutbuddin Bakhtiar Kaki*.
- *He patronized writers like: Hasan-un-Nizami* (author of Tajul-Ma'asir) and *Fakhruddin*.

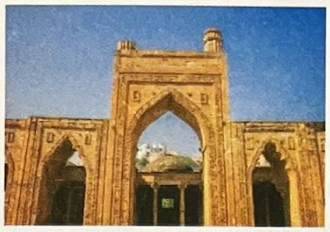
Qutub Minar



- It is an *Indo-Islamic* structure having 5-storeys (*73* or *72.5* m high)
- UNESCO world heritage site: 1993.

Qutub Minar was built by:

- *Qutb-ud-din Aibak* (laid foundation).
- Iltutmish (added three more stories to it).
- Firoz Shah Tughlaq (repaired and built the top story).



Quwwat-ul-Islam

- It is made in *corbel arch* technique.

Adhai din ka Jhonpra

- Earlier it had Jain Monasteries. *(Basadis)*

Shamsuddin Iltutmish (1211 AD-1236 AD)

- He was son-in-law of *Qutb-ud-din* and was governor of Budaun (UP).
- He defeated Aram Shah (son of *Qutb-ud-din Aibak*) in 1211 AD to ascend the throne.
- He shifted his capital from *Lahore* to *Delhi*.
- He saved Delhi Sultanate from the wrath of *Genghis Khan* (Genghis also *attacked Transoxiana* region in 1219 AD. He *died in 1227 AD)*.
- *Nizam-ul-Mulk* was his *Wazir* (Prime Minister).
- He patronized scholars like *Minhaj-i-Siraj* (wrote: *Tabaqat-i-Nasiri*).
- He set up the official nobility of 40 loyal slaves known as *Chahalgani*. These were *Turkish* slaves.
- He built *Hauz Shamsi*, a Water Reservoir in Delhi.
- He introduced *Silver coin (Tanka)* and *Copper coin (Jital)*.
- He introduced the *Iqta system*. Under this, a part of *land (iqta)* was given to military commander *(Iqtadar/Muqti)* in exchange for military service, revenue collection, and local administration, essentially functioning as temporary, transferable revenue assignments rather than hereditary land grants.

Silver Tanka and Copper Jital Coins

Razia Sultana (1236 AD-1240 AD)

- She was the daughter of *Iltutmish*.
- *She was the first and the only woman ruler of the Delhi Sultanate.*
- Altunia, Governer of Bhatinda refused to accept suzerainty of Razia. Razia and *Yakut* (an Ethiopian slave) marched against Altunia.
- Altunia murdered Yakut and imprisoned Razia in *Quila Mubarak of Bhatinda* (Later Altunia and Razia got married).
- In 1240 AD, Razia and Altunia became the victims of a conspiracy by *Khokhar tribe* and were assassinated near Kaithal (Haryana).

- *Minhaj-i-Siraj*, in his book, *Tabaqat-i-Nasiri*, writes - "The king was entirely slaved by dissipation and debauchery that Razia was more able and qualified than her brothers".

Ghiyasuddin Balban (1266 AD-1287 AD)

- ***Original name:*** *Baha-ud-Din*.
- He was earlier a *Naib* under *Nasiruddin Mahmud*.
- He broke the power of *Chalisa* (abolished *Chahalgani* system) and restored the prestige of the crown.
- He established the military department *Diwan-i-Arz*.
- ***Title taken:*** *Zil-i-Ilahi* (Shadow of Allah) and *Ulugh Khan* → Balban considered himself as a descendant of *Afrosiyab*.
- He introduced *Sijda* (prostration before the monarch) and *Paibos* (kissing the feet of monarch) as the normal forms of salutation.
- He started *"Blood and Iron Policy"*.
- He started *Nowruz* (Iranian or Parsi New Year) in Delhi Sultanate.
- Indian Muslims and Hindus never attained high positions during his reign.
- *Tughril Beg*, the Governor of Bengal (*Lakhnauti*) under Sultan Balban, revolted against him and declared himself as an independent ruler of Bengal in 1279. Later, he was assassinated by Balban with the help of his son Bughra Khan.

Qaigabad (1287 AD-1290AD)

Kabhi Kabhi lagta hai apun hi bhagwan hai
~*Balban*

- He was the last ruler of Slave Dynasty and grandson of Balban.

Important Officers

Wazir	Prime Minister (looked after Finance Department)
Amil	Collected revenue
Amir	Governor of Pargana
Naib	Incharge of all other departments except Finance/deputy to Sultan
Muqti / Wali / Iqtedar	They hold iqta
Mustaufi	General
Barid	Spies
Khwaza / Musharaf	Accountant

KHILJI DYNASTY (1290 AD-1320 AD)

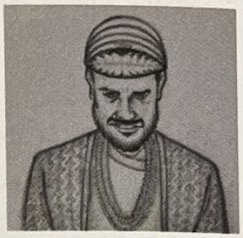
- Khiljis were *Turks* but did not belong to the Ilbari tribe or Shamshi tribe.

Jalal-ud-din Khilji (1290 AD-1296 AD)

- He was the *founder* of Khilji Dynasty.
- He was a very lenient ruler and allowed Hindus and non-turks to attain high positions.

Alauddin Khilji (1296 AD-1316 AD)

- ***Real name:*** *Ali Gurshasp*
- He was the *nephew* and *Son-in-law* of Jalal-ud-din Khilji.
- Alauddin khilji killed his uncle and Sultan, Jalaluddin Khilji, after his successful 1296 raid on Devagiri.
- Alauddin lured Jalaluddin to Kara, claiming to present the treasures, and had him murdered during a meeting on a boat on the Ganges river.
- He reversed the policies of Jalal-ud-din.
- Nushrat Khan was the brother of Alauddin.
- He held the title of *Amir-i-Tuzuk* (Master of Ceremonies) during the reign of Jalaluddin Khilji.
- He *abolished* iqta system in the Delhi Sultanate.



Malik Kafur

Alauddin's Expeditions

- ***Gujarat (1298 AD):*** Appointed Ulugh and Nushrat Khan & captured Ahilwara.
- Defeated *Rai Karan* (Vaghela King of Gujarat) and put his wife to Harem.
- **Ranthambore** (1301 AD) → Then King: Hammir Dev Chauhan (Evidence of first *Jauhar* found during this time).
- *Mewar (1303 AD)* → *Capital: Chittor (King: Ratan Singh).*

Chittorgarh Fort, built by King Chitranga Mori (also known as Chitrangda) of the Maurya dynasty and later restructured by Rana Kumbha.

- *Malwa (1305 AD)*
- *Jalor (1311 AD)*

> *Alauddin bought him from Gujarat Market at 1000 dinars hence Malik Kafur is also known as 'Hazar Dinari'.*

In Deccan

- Alauddin's army was led by *Malik Kafur* (he was a eunuch).
- He defeated:
  - *Ramachandra* (Yadava Dynasty ruler of Devagiri) (1308 AD), Khilat and Chhatra was given to Ramchandra by Alauddin
  - *Prataparudra Deva* (Kakatiya Dynasty ruler of Warangal) (1310 AD)
  - *Vira Ballala III / Ballala Deva* (Hoysala Dynasty ruler of Dwarasamudra) (1311 AD)
  - *Vira Pandya* (Pandya Dynasty ruler of Madurai) (1311 AD), Malik Kafur became Malik Naib (personal representative of Sultan) after this victory.
- Title taken by Alauddin after the Deccan expedition: *Sikandar-i-Sani (Second Alexander)*.
- After the Deccan expedition, Malik Kafur built a mosque *(Alia al-Din Khaldji) in Rameshwaram*.

Court Poet Khusrau

- Alauddin conferred the title of *Tuti-e-Hind* (Parrot of India) to Khusrau, his favourite court poet.
- He started *Qawwali* in India. He also invented Tabla and Sitar.
- Khusrau gave *Sultan-e-Jahan* title to Khilji.
- ***His famous books:*** *Tughlaq Nama* and *Nuh-i-Sipihr*.
- He was the first to mention Jauhar in Persian *(in his book Khazain-ul-Futuh)*.

Administrative Reforms Introduced by Alauddin

- *Dagh* (the branding of horse) and *Chehra* (also known as *Huliya*, for identification of his soldiers).
- Alauddin Started the system of *Cash Payment (Naqdi)* to Soldiers.
- Weakened the power of Intermediaries like Rana and Rawats of Rajput rulers.
- Weakened the power of the Village Head called *Muqaddam* or *Chaudhary*.
- Imposed heavy taxes: Ordered all lands to be measured by a Special Officer: *Mustakharaj* (one who collected the revenue). The share of state was then fixed based on this measurement.
- ***Taxes Imposed:*** *Jaziya* (levied on Non-Muslims) and *Zakat* (levied on Muslims).
- ***He introduced three new taxes:*** *Ghari* (house tax), *Charai* (a tax levied on use of grasslands for grazing animals), and *Kharaj* (a land tax imposed on peasants, amounting to *50% of their produce*).
- ***Three markets setup by Alauddin:***
  - Food Grains Market: *Mandi*
  - Cloths/Costly Items Market: *Sarai-i-Adl.*
  - Horses, Slaves and Cattle Market
- ***Each market was under control:*** *Shahna* (high officer) who maintained a register of the merchants, shopkeeper and the prices.
- He fixed the price of all products in order to maintain a huge standing army.
- *Dirham* or *Dam* were used as currency.
- All products were brought to the Market by *Banjaras*. *Shahna* were appointed to look after Banjaras.
- Network of spies (intelligence officers) started by Alauddin were: *Munhiyans* and *Barid*.
- Alauddin started "*Alai gaz*" - a measuring unit.

Note:
- *Padmaavat, written by Malik Muhammad Jayasi in 1540, mentions the first Jauhar of Chittor, performed by Rani Padmini (or Padmavati) in Chittorgarh in 1303 CE.*

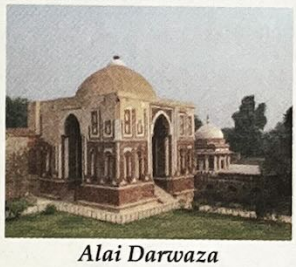
Agricultural Reforms of Alauddin:

- Started land measurement in units of Bigha and Biswa *(1 Bigha = 20 Biswa)*.
- Started land confiscation *(like waqf)* and converted them to agricultural land.
- Villages were brought under Khalisa (land not covered under Iqta), also Doab region was brought under Khalisa.
- **Land Revenue:** Half of the agricultural produce (called *Kharaj*); directly collected revenue from farmers, and eliminated intermediaries like khots and muqaddams.

Officers:
Mutasarrif: *Collected Arrears*
Gumasthas: *Agent*

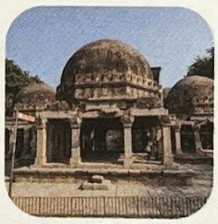
Alauddin Built

- ***Alai Fort***
- ***Hauz Khas (tank)***
- ***Alai Darwaja (entrance of Qutub Minar)***
- ***Palace of thousand Pillars (Hazar Sutun)***



Alai Darwaza
It is built of red sandstone

Alai Fort

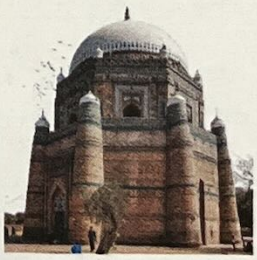


Hauz Khas (tank)

Hazar Sutun

He Established

- The city *Siri* which was *second* of the seven cities of Delhi (1st city of Delhi: *Qila Rai Pithora* established by *Tomar Dynasty*).
- ***Tomb of Alauddin:*** *Delhi.*
- ***He was patron of:*** Art and learning.
- ***In 1316:*** Malik Kafur *(Hajar-Dinari)* seized the throne after Alauddin's death.
- ***Alauddin had two sons:*** *Mubarak* (1316-20 AD) and *Omar*.



Tomb of Alauddin

Mubarak firstly killed Malik Kafur and then Omar.

- Mubarak was finally killed by his own slave Khusrau Khan in 1320 AD.

TUGHLAQ DYNASTY (1320 AD - 1414 AD)

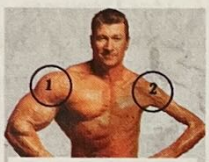
Ghiyasuddin Tuglaq (1320 AD-25 AD)

- Last King of Khilji Dynasty *Khusrau Khan* was killed by *Ghazi Malik* (took title: Ghiyasuddin Tuglaq).

- He built the city of *Tughlaqabad* (3rd city of Delhi) and the *Tughlaqabad Fort*.
- He died in an accident and was succeeded by his son Jauna (Ulugh Khan) who assumed the title *Muhammad bin Tughlaq*.

Muhammad bin Tughlaq (1325 AD-1351 AD)

- **Original name:** *Jauna*.
- He had the largest kingdom of all.
- He increased taxation in Doab region in 1325 to fund his projects, including his large army.
- He is also known as *"wisest fool"*, due to his failed policies.
- He transferred the capital from *Delhi* to *Daulatabad* (also known as *Devagiri*) in 1327 and later he again reversed his decision.
- He also gave *Sondhar* loan (cash in exchange of gold) and *Taccavi* loan as agricultural loans.
- **Religious Visit:** He was the first Sultan to visit the *tomb of Moinuddin Chishti (Ajmer)*.



1: MBT's Ideas
2: MBT's Execution

His Failed Policies

- He introduced Token currency (copper and brass) in *1329* with high value.
- *Khorasan Expedition in 1329.*
- *Qarachil Expedition in 1330.*

Administrative Positions

- Muhammad bin Tughlaq appointed people from variety of background to high administrative positions {mentioned by *Ziauddin Barani* in his book *Tarikh-i-Firuz Shahi* (Fatwa-i-Jahandari)}.
- He also setup an agricultural department: *Diwan-i-Kohi*.

A wine distiller	Aziz Khummar
A barber	Firuz Hajjam
A cook	Manka Tabbakh
Two gardeners	Ladha and Pira

Literary Sources:

- *Ibn Battuta*: A traveller from Morocco who wrote *Rihla (in arabic language)* (In his book, Muhammad Bin Tughlaq is mentioned as one of the four great/powerful rulers of the world).
- **Postal System:** (Described by Ibn Battuta):

- *Uluq:* **Horse post** (Stations were kept at a distance of 4 miles).
- *Dawa:* **Foot post** (There were 3 stations per mile). The foot runners carried a *Copper Bell* to announce their arrival.

Architecture

- Built the city of *Jahanpana (4th city of Delhi)* and the *Begumpuri Mosque*.
- Built the Mausoleum (Dargah) of Nizamuddin Auliya in Delhi.

Firoz Shah Tughlaq (1351 AD-1388 AD)

- He was the cousin of Muhammad Bin Tughlaq.
- His coronation was done at *Thatta (Sindh, Pakistan)* in 1351 AD.
- He wrote his *autobiography titled Fatuhat-i-Firozsahi.*

Military policy

- Soldiers were not paid in cash but by assignments on land revenue of villages called *Vajeha* or *Wajh*.
- The Iqta system was made hereditary.

Taxation (Based on Quran):

- *Kharaj:* Land tax (1/10 of the produce).
- *Zakat:* 2.5% tax on property.
- *Jizya:* Levied on Non-Muslims (It became a separate tax during his time).
- *Khams:* 1/5 booty captured during war.
- *Irrigation Tax (Haque-i-Sharb):* He repaired canals and imposed *Hasil-i-Sharb* (water tax).
- Firoz Shah introduced two more types of coins :

  Adha: Represented **50% (half) of a jital.**

  Bikh: Represented **25% (one-quarter) of a jital.**
- *Ulema:* Religious officer.

Construction:

- He built new cities: *Fatehabad, Hisar, Jaunpur* {in the name of Muhammad Bin Tughlaq (Jauna)}and Firozabad (5th city of Delhi).
- Built the 5th storey of Qutub Minar

Social Work:

- He was the first Sultan to start the translation of Hindu *Religious texts into Persian*.
- He established a hospital at Delhi: *Dar-ul-Shifa*.
- New departments were set up by him: *Diwan-i-khairat* (Department of Donations) and *Diwan-i-Bandagan* (Department of slaves) .

Succession & End of Tughlaqs:

- FST's Wazir (PM) *Khan-i-Jahan Maqbul* took over the administration after his death.
- After him, his son Khan-i-Jahan II became Wazir but faced conflict with Prince Muhammad.
- Nasiruddin Mahmud Shah became the Sultan.

Timur Invasion *(1398 AD)*

- He invaded during the reign of the last ruler of Tughlaq Dynasty *Mahmud Shah Tuglaq*/Nasiruddin Mahmud Shah.

• After defeating the Delhi army, Timur appointed Khizr Khan as the ruler of Multan.

• **Death:** Timur died in 1405 AD while on his way to conquer China.

SAYYID DYNASTY (1414 AD - 1451 AD)

• ***Founder:*** *Khizr Khan* (1414 AD - 1421 AD) → Title taken: *Rayat-e-Ala*.

• They were known as *"Kulah-Daran"* (cap wearers).

• Khizr Khan defeated Sultan *Daulat Khan* and occupied Delhi and founded Sayyid dynasty.

• *Tarikh-i-Mubarak Shahi* was written by *Yahya-bin-Ahmad Sirhindi*, where he tells that Sayyids were the descendants of *Prophet Muhammed*.

• *Alam Shah* was the last ruler of the Sayyid dynasty.

LODI DYNASTY (1451 AD-1526 AD)

• Lodi's were of *Afghan origin*.

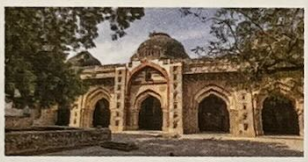
• ***Founder:*** *Bahlol Lodi* (1451 AD-1489 AD).

Sikandar Lodi (1489 AD-1517 AD)

• He is also known as *Nizam Shah*.

• He founded Agra in *1504* and later made it his capital in *1506*.

• ***He introduced:*** *Gaz-i-Sikandari* (Sikandar's yard) of *32 digits* to measure cultivated fields.



Moth ki Masjid
It is a double dome structure.

• Translated *Ayurvedic texts to Persian*.

• He was a poet and composed poems in Persian, under the name *Gulrukhi*.

• ***He gave orders to build:*** *Moth ki Masjid (in Delhi).*

Ibrahim Lodi (1517 AD-1526 AD)

• He was the last ruler of Delhi Sultanate.

• The *Battle of Khatoli* was fought in 1517–1518 between the Rajput forces of *Mewar* under Rana Sanga and the *Sultanate of Delhi* under Ibrahim Lodi where Rana Sanga had a decisive victory.

• Babur was invited to attack on Ibrahim Lodi by *Daulat Khan Lodi* (who was the *governor of Punjab* under Ibrahim Lodi) and *Alam khan* (Ibrahim Lodi's uncle).

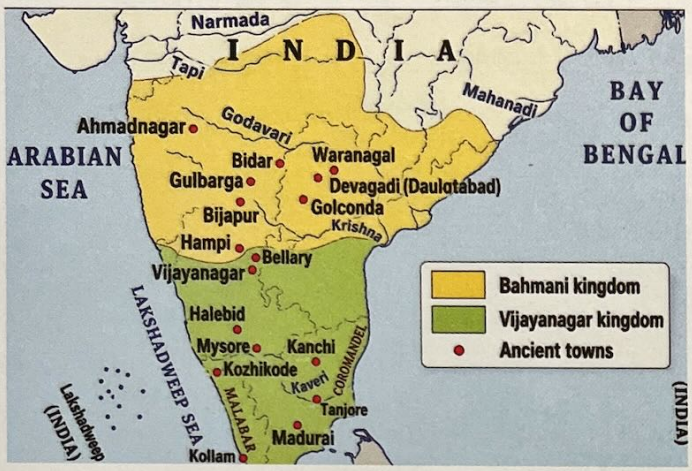
• He fought and lost the *First Battle of Panipat* against *Babur* in *1526 AD*.

Some Key Departments under Delhi Sultanate

Central Administration	*Department Of*	*Started By*
Diwan-i-Wizarat (Headed by the Wazir)	Department of Finance	
Diwan-i-Arz (Headed by the Ariz-i-Mumalik)	Military Department	Balban
Diwan-i-Insha (Headed by Dabir-i-Khas or Dabir-i-Mumalik)	Department of Correspondence	
Diwan-i-Risalat (Headed by Sadr-us-Sudur or Qazi-ul-Kazat)	Department of Religious affairs	
Diwan-i-Mushtakharaj	Department of Arrears	Alauddin
Diwan-i-Riyasat	Department of Commerce	Alauddin
Diwan-i-Kohi	Department of Agriculture	Md. bin Tughlaq
Diwan-i-Bandagan	Department of Slaves	Firoz Shah
Diwan-i-Khairat	Department of Charity	Firoz Shah
Diwan-i-Ishthiaq	Department of Pension	Firoz Shah Tughaq

VIJAYANAGARA EMPIRE (1336 AD-1565 AD)

- The meaning of Vijayanagara: *City of Victory*.
- ***Capital:*** *Hampi* (which is derived from the name of local mother goddess *Pampadevi*) is situated on the banks of the Tungabhadra River.
- The ruins of Hampi were brought to light in 1800 by *Colin Mackenzie* (the first Surveyor General of India).
- Hampi was declared as *UNESCO World Heritage Site* in the year *1986*.



- *Alexander Greenlaw* took the first detailed photographs of archaeological remains of Vijayanagara (Hampi).
- *John Marshall* began the conservation of the archaeological remains of Vijayanagara (Hampi).
- Contemporaries describe this empire as *Karnataka Samrajyamu*.
- Early Vijayanagara rulers called themselves as *Hindu Suratrana*.
- *Vijayanagara* kings were also know as *"Raya"*.
- *Vijayanagara* → *Narapati* (Lord of men).
- *Odisha* rulers → *Gajapati* (Lord of elephants).
- *Bahmani* rulers → *Ashvapati* (Lord of horses).
- Local communities of merchants → *Kudirai Chettis*.
- Muhammad Bin Tughlaq was the ruler of Delhi Sultanate when this empire was established.

Four Important Dynasties of Vijayanagara Empire

Dynasty	*Period*	*Founder*
Sangama	1336 AD-1485 AD	Harihara and Bukka
Saluva	1485 AD-1505 AD	Saluva Narasimha
Tuluva	1505 AD-1570AD	Veer Narashimha/ Narasa nayaka
Aravidu	1570 AD-1650 AD	Tirumala

Sangama Dynasty

Harihara I and Bukka *(1336 AD-1356 AD)*

- They are the founders of Sangama Dynasty (1336 AD-1485 AD) *(sons of Sangama)*.
- They were the feudatories of *Kakatiyas* and later became ministers in the court of *Kampili*.
- Title taken by *Harihara I: Karnataka Vidhya Vilas*.
- Bukka is credited with renaming *Vidyanagar* to *Vijayanagara*.
- *Deva Raya I* and *Deva Raya II* succeeded Harihara and Bukka.

Deva Raya I (1406 AD – 1422 AD)

- Conflict with Bahmani Kingdom: He was initially defeated by Firuz Shah Bahmani.
- As part of the peace treaty, Deva Raya I gave his daughter in marriage to Firuz Shah. He also lost the territory of *Bankapur* as *dowry*.
- In a subsequent battle, Deva Raya I successfully defeated Firuz Shah Bahmani.
- The *Hiriya Canal* was developed during his reign. It drew water from the Tungabhadra river and irrigated the valley, supplying water to the "Sacred Centre" and the "Urban Core"

Deva Raya II (1425 AD - 1446 AD)

- In 1443, he crossed the Tungabhadra river to try and recover *Mudgal* and *Bankapur* (regions south of the Krishna river).
- He built Kamalapuram Tank . It was built to support the city's water needs.
- Fernao Nuniz, a Portuguese traveller in his work noted that the kings of Ceylon (Sri Lanka), Pulicat, Pegu, and Tenasserim paid tribute to Deva Raya II.

Saluva Dynasty

Saluva Narasimha *(1485 AD-1491 AD)*

- He is the founder of Saluva Dynasty (1485 AD-1505 AD).

Tuluva Dynasty

Veera Narasimha/ Narasa Nayaka *(1505 AD-1509 AD)*

- He was the founder of Tuluva Dynasty (1505 AD-1570 AD).

Krishna Deva Raya *(1509 AD-1529 AD)*

- He was placed on the throne by Saluva Timma, the Chief Minister of Veera Narasimha.
- Considered the greatest king of the Vijayanagara Empire.
- Title taken: *Yavanaraja Sthapnacharya* (Restorer of the Yavana/Bidar Kingdom), *Abhinava Bhoja, Andhra Pitamaha / Andhra Pratimah* (Grandfather of Andhra) .

Architecture & Cities:

- He built: *Vijaya Mahal* (House of Victory), *Hazara Rama Temple*, and *Vitthal Swami Temple* (dedicated to Lord Vishnu).
- Founded a suburban township named *Nagalapuram* (after his mother).

Literature:

- He was a gifted scholar in Telugu and Sanskrit.
- His works include: ***Amuktamalayada*** (Telugu work on statecraft) and ***Jambavati Kalyanam*** (Sanskrit drama).
- His court was adorned by the ***Ashtadiggajas*** (8 great poets):

1. Tenali Ramakrishna
2. Allasani Peddana
3. Madayyagari Mallana
4. Nandi Thimmana
5. Pingali Surana
6. Ramarajabhushanudu
7. Dhurjati
8. Ayyalaraju Ramabhadrudu

- He gave permission to Albuquerque (a Portuguese Governor) to build a fort at ***Bhatkal (port)***.

Military Achievements:

- He defeated the rulers of ***Odisha (Gajapatis)*** in his early days.
- He defeated Ismail Adil Shah (Bijapur) and restored the Raichur Doab (region between Krishna and Tungabhadra) in 1520 AD.

Decline of the Empire:

- After the death of Krishna Deva Raya, his brother Achyuta Deva Raya ascended the throne.
- Upon Achyuta's death in 1542, his nephew Sadashiva Raya was appointed Emperor.
- However, the real power lay in the hands of Aliya Rama Raya (Krishna Deva Raya's son-in-law), who acted as the caretaker/regent.
- Due to much interference by Aliya Rama Raya in the internal affairs of the Deccan Sultanates, they decided to attack Vijayanagara.

Battle of Talikota (1565):

- Also known as the ***Battle of Rakshasi Tangadi*** or the ***Battle of Bannihatti***.
- In this battle, the combined army of ***Bijapur, Ahmednagar,*** and ***Golconda*** attacked and ransacked the Vijayanagara Empire.
- After the battle, the Vijayanagara empire continued to rule in a very small part of its former territory.
- The capital was shifted to ***Penukonda*** and later to ***Chandragiri*** to survive the attacks.
- The last ruler was ***Sri Ranga III (Aravidu Dynasty)***.

Administration and Economy:

- ***Ayagar System:*** Each village was organised as an independent unit for the operation of rural administration, and ***12 officers*** were appointed for their operations.
- **Administrative Hierarchy:**

Rajya (Province) → ***Mandalam*** (District) → ***Sthala*** (Group of Villages) → ***Grama*** (Village).

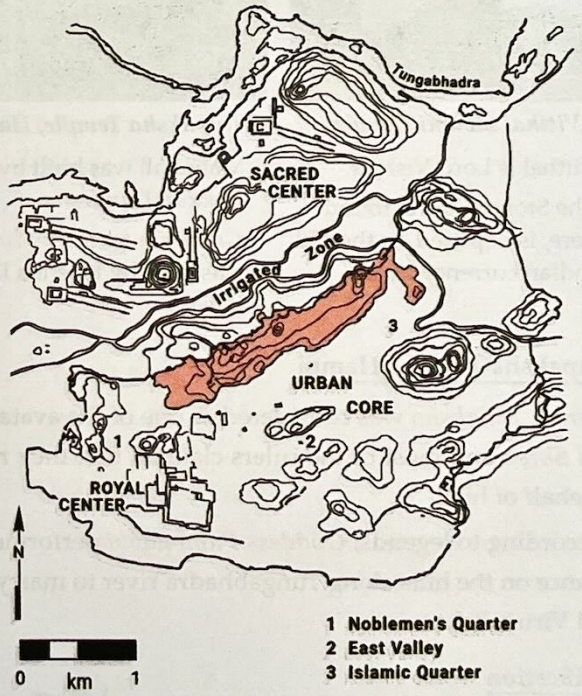
- ***Amara-Nayaka System:*** Amara-Nayakas were military commanders who were given territories to govern.
- This system flourished under Krishna Deva Raya.
- The term ***Amaram*** refers to the land given to them.

Travellers	*During the Reign of*	*Country*
Ibn Battuta	Harihara and Bukka	Morocco
Nicolo de Conti	Deva Raya I	Italy
Abdur Razzaq	Deva Raya II	Persia
Duarte Barbosa	Krishna Deva Raya	Portugal
Domingo Paes	Krishna Deva Raya	Portugal
Fernao Nuniz	Achyuta Deva Raya	Portugal
Nikitin	Bahmani Period	Russia

Architecture and City Planning

Royal, Sacred and Urban Centre of Vijayanarara Empire

- **Royal Centre:** Located to the southwest of Tungabhadra river, all kings used to reside here. It had over 60 temples and 30 palaces.
- **Sacred Centre:** Located in the north; containing the temples.



- **Urban Core:** Residential area for the general population.

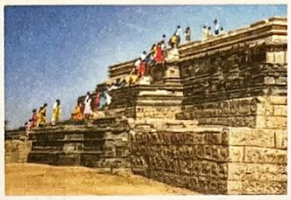
Lotus Mahal

- Council chamber where king and his advisors met.

Elephant Stable

- (Possibly built by Krishna Deva Raya).

Mahanavami Dibba



- It was spread across 11,000 sq ft.
- Height: 40 ft.
- It was considered as a large platform which was used for *royal ceremonies*.
- Walls have *relief carvings* on it.

Kamalapuram Tank

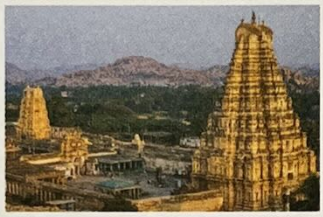
- It is a stepped tank built by *Deva Raya II*.
- **Function:** It was used for field irrigation and to channel water specifically to the "Royal Centre".

- *Anantaraj Sagar Tank* and *Hiriya Canal* were also built by Vijayanagara rulers.

Sacred Centre

Vitthal Swami Temple

- Vitthal is Lord Vishnu.
- The Stone Chariot found here, is depicted on the ₹50 Indian currency note.



Virupaksha Temple, Hampi

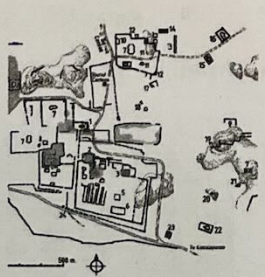
- Main hall was built by: *Lakkan Dandesha*.
- *Gopuram (gateway tower)* was built by Krishna Deva Raya.

Virupaksha Temple, Hampi

- *Lord Virupaksha* was considered as one of the avatars of *Lord Shiva* and most of the rulers claimed that they ruled on behalf of him.
- According to legends, *Goddess Pampadevi* performed penance on the hills along Tungabhadra river to marry Lord Virupaksha.

Fortification

- According to persian traveller *Abdur Razzaq*, there were seven levels of fortification for not just the city but also for agricultural fields and forests in Vijayanagara Empire.
- *Provida style of architecture* was introduced by Vijayanagar rulers.



Fortification of Vijayanagara Empire

BAHMANI KINGDOM

- They ruled to the *North of Krishna river*.
- The entire Bahmani Kingdom was divided into *four* administrative units called *Province (Taraf)*:

1. ***Gulbarga***
2. ***Bidar***
3. ***Berar***
4. ***Daulatabad***

Ala-ud-din Hasan Bahman Shah (1347 AD-1358 AD)

- Founder of Bahmani Kingdom.
- He was also known as *Hasan Gangu*.
- ***Capital:*** *Gulbarga* (first capital).
- He claimed descent from the Iranian hero Isfandyar.
- He defeated *Kakatiyas of Warrangal*.

Taj ud-Din Firoz Shah (1397 AD-1422 AD)

- He is also known as *Firoz Shah Bahmani*.
- He defeated *Deva Raya I* and married his daughter, however *Taj ud-Din* got defeated in the subsequent battle.

Ahmad Shah Wali (1422 AD - 1435 AD)

- He shifted the capital from *Gulbarga to Bidar*.
- Associated with the Sufi saint Gesu Daraz.

Mahmud Gawan (a trader)

- He was a *Peshwa* during Bahmani Kingdom.
- Gawan conquered the Vijayanagara territories up to Kanchi.
- He captured *Chaul* and *Dabhol ports* from the Vijayanagara Empire.
- Titles: *Khwaja-i-Jahan* and *Malik-ut-Tujjar* (Chief of Merchants) → by Humayun Shah.
- Gawan served under Humayun Shah.
- Humayun Shah was one of the Bahmani rulers who was known for cruelty and hence got the title *"zalim"*.

Traders during Bahmani Kingdom

- They were also known as *Amirs* and were of two types (provided military support to Bahmani rulers)

1. ***Afaqui/Pardesi:*** Sunni muslims from Iran and Iraq.
2. ***Deccani:*** Local Shia muslims.

- ***Khalisa land: Land that was demarcated to run the expenses of King and royal household.***
- ***Tarafdar was someone who governed the provinces and extracted revenues.***

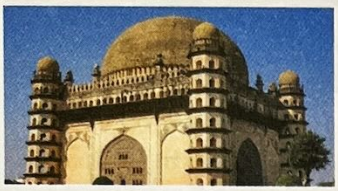
Disintegration of Bahmani Kingdom

Kingdom	Founder	Dynasty
Berar	Fathullah Imad-ul-Malik	Imad Shahi
Bijapur	Yusuf Adil Shah	Adil Shahi
Ahmednagar	Malik Ahmed	Nizam Shahi
Golconda	Quli Qutub Shah	Qutub Shahi
Bidar	Amir Ali Barid	Barid Shahi

Muhammad Adil Shah (Adil Shahi Dynasty)

- He introduced *Dakhini* as court language in place of *Persian*.

Gol Gumbaj was built by Adil Shah. It is famous for 'Whispering Gallery" and the architecture was designed by Yakut of Dabul.



Gol Gumbaj

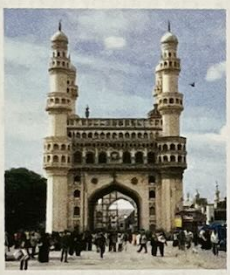
- It is the second largest dome in the world.
- Location: Vijayapura (earlier called Bijapur), Karnataka.

Quli Qutb Shah

- He is the first ruler of *Qutub Shahi Dynasty*.
- The famous *Golconda Fort* was first built by Kakatiya Dynasty and was later fortified by Qutub Shahi rulers.
- Golconda is famous for *Diamond mines*.

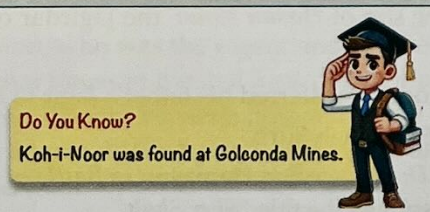
Golconda Fort

- He founded the city of *Hyderabad* (originally known as *Bhagyanagar* after *Bhagmati*, a local dancing girl with whom Sultan had fallen in love).
- He also built the famous *Charminar*.



Charminar

• Ibrahim Adil Shah II wrote Kitab-i-Nauras , a collection of songs in praise of Hindu deities and Muslim Saints .
• The 'Pettanulkars' migrated from the Gujarat region to the Vijayanagara State. They were Silk weavers.
• The tomb of Ahmad Shah Al Wali Bahmani is built in Ashtoor, Karnataka.
• The craftspersons of Bidar were famous for their inlay work in Copper and Silver.



THE MUGHAL EMPIRE

Babur (1526 AD-1530 AD)

- Babur defeated *Ibrahim Lodhi* in the *1st Battle of Panipat* on April 21, 1526 AD and was the founder of *Mughal Dynasty*.
- ***Original name:*** *Zahiruddin Muhammad Babur*.
- ***Title assumed:*** *Padshah* (in 1507 AD at Kabul).
- **Lineage:** He had the blood of two great conquerors:

  Father's side: Descendant of *Timur*.

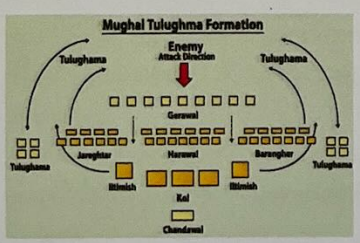
  Mother's side: Descendant of *Genghis Khan (Mongol)*.
- Babur was from *Uzbekistan*.
- When he was *12 years old*, he became the ruler of *Ferghana* in *1494*.
- He was forced to leave his throne after the Uzbegs, another Mongol group, invaded.
- He conquered Kabul in *1504 AD*.
- **Entry into India:** Daulat Khan Lodi invited Babur to India to fight against Ibrahim Lodi.
- Before Panipat, Babur conquered Bajaur and Bhera in 1519. This was the first time he used Gunpowder in this region.
- In battles, he was the *first to use gun powder massively*.

Battles of Babur

- *1st Battle of Panipat (21 April, 1526 AD):* Defeated Ibrahim Lodi. This victory laid the foundation of the Mughal Dynasty).
- *Battle of Khanwa (1527 AD):* He defeated Rana Sanga of Mewar at Khanwa (Babur assumed the title "Ghazi" after this victory).
- *Battle of Chanderi (1528 AD):* He defeated Medini Rai of Chanderi.
- *Battle of Ghagra (1529 AD):* He defeated Afghans (Mahmud Lodi).

- ***1530:*** He died at Agra. Initially buried in Agra (Aram Bagh), but his remains were later moved to Kabul (Afghanistan).

- **Military Strategy-**
- Babur was the first to use Gunpowder massively in Indian warfare.
- Tulughma Formation: His specific war strategy used in Panipat. It involved dividing the army into:



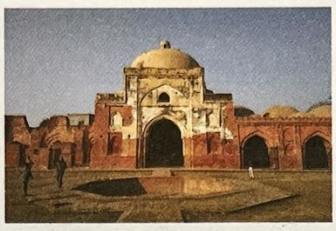
- Harawal (Center/Vanguard)
- Jaranghar (Left Wing) & Baranghar (Right Wing)
- Tulughma (Flanking units to encircle the enemy).

Tulughma Formation

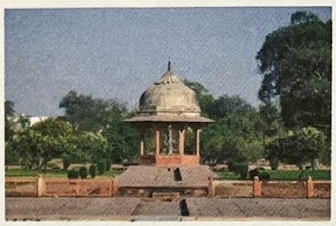
Autobiography of Babur

- *Tuzuk-i-Baburi* in *Turkish*.
  - It was translated to *Persian* language, named → *Baburnama* by *Abdur Rahim Khanekhana*.
  - It was translated to English by *Madam Beveridge*.

Architecture built by Babur



Kabuli Bagh
(Mosque in Panipat)



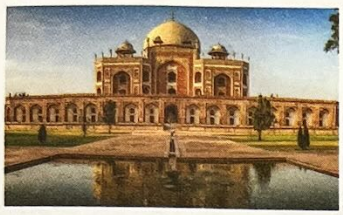
Aram Bagh
(in Agra)

Humayun (1530 AD-1540 AD and 1555 AD-1556 AD)

- He was the *eldest son* of Babur.
- He had a broken reign (ruled in two parts).
- He ascended the throne in *1530 AD*.
- His succession was challenged by his brothers: *Kamran, Hindal, Askari* and *Afghans* as well.
- Humayun's brother Kamran controlled Afghanistan and Punjab regions.
- He fought two battles against *Sher Shah Suri* (Afghani ruler) at *Chausa* in *1539 AD* and at *Kannauj/Bilgram* in *1540 AD*, where he was completely *defeated* by Sher Shah.
- Humayun, after losing the battle took refuge at *Safavid Dynasty* (Iran).
- Rani Karnawati of Mewar once sent a Rakhi to Humayun seeking protection against Bahadur Shah of Gujarat.
- His sister *Gulbadan Begum*, wrote his biography *"Humayunama"*.
- After Sher Shah's death, Humayun regained his empire in 1555 AD.
- He built *Din Panah* at *Delhi* as his 2nd capital.
- He died in *1556 AD* after falling from the stairs of his library.

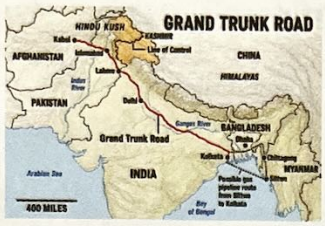
Sher Shah Suri (1540 AD-1545 AD)

- ***Original name:*** *Farid Khan*.
- He was the son of *Hasan Khan*, the Jagirdar of Sasaram (Bihar).
- Ibrahim Lodhi transferred his father's Jagir to him.
- Battles of Sher Shah Suri:
  - *1539 AD:* He defeated Humayun in *Battle of Chausa* and then assumed the title *"Sher Shah"*.
  - *1540 AD:* He defeated Humayun in *Battle of Kannauj/ Bilgram* and annexed Kannauj under him.



Humayun's Tomb,
(at New Delhi)

- **Built by:** *Bega Begum* {also known as *Haji Begum* (his widow)}.
- **Architect:** *Mirak Mirza Ghiyath*.



Sarai were shelters that provided food, water, and lodging for travelers while travelling through the GT Road.

> • *Humayun's Tomb: First garden tomb in India, UNESCO World Heritage Site.*

Administrative Reforms:

- He introduced the *Rupia (silver coin)*.
- Fixed standard weights and measures across the empire.
- **Direct Control:** Removed Zamindars in many areas to collect taxes directly.
- *Pargana* (an administrative unit comprising several villages) during Sher Shah was led by *Shiqdar*.

Land Revenue system:

- Land was measured accurately.
- Tax was fixed at *1/3rd* of the average produce.
- Introduced *Patta* (Title deed) and *Qabuliyat* (Agreement deed) to define peasants rights and taxes.

Infrastructure:

- Built the Grand Trunk Road connecting Chittagong (Bangladesh) to Peshawar.
- ***Death:*** In 1545 AD during the conquest of Kalinjar (due to a gunpowder explosion).
- He built *Purana Quila* (Old Fort) at Delhi.
- His tomb is located at *Sasaram (Bihar)*.
- After his death, his son Jalal Khan ruled (took the title Islam Shah Suri).

Akbar (1556 AD-1605 AD)

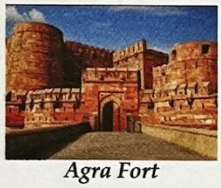
- One of the *greatest rulers* of Mughal Dynasty.
- *Eldest son* of Humayun.
- *Full name: Abu'l-Fath Jalal-ud-din Muhammad Akbar*.
- Akbar ascended the throne at the age of *13* at *Kalanaur, Punjab*.
- *Bairam Khan*, who was the regent and tutor of *Akbar* led the Mughal forces in the *2nd Battle of Panipat* in *1556* which was fought between him and *Hemu* (the Hindu General of Adil Shah Suri). Hemu was defeated, captured and slain.
- Akbar tried to win over the Rajputs wherever possible and inducted Rajput kings into Mughal service and treated them at par with Mughal nobility.
- *Married: Harka Bai/Jodha Bai* (daughter of *Bharmal* → *Kachhwaha Rajput ruler of Amer*). She was later honoured with title *"Mariam-uz-Zamani"* after she gave birth to Jahangir.
- *Rana Pratap Singh* and son *Amar Singh* (Sisodiya Rajputs of Mewar, Capital: Chittor) did not recognize his supremacy.
  - ***This resulted in:***
    - Battle of Haldighati (1576): Between Maharana Pratap (Sisodiya Rajputs of Mewar, Capital: Chittor) and the Mughal Army led by Raja Man Singh of Amer. Rana Pratap and his son Amar Singh did not recognize Mughal supremacy. Rana Pratap never surrendered.

Religious Reforms

- *Ibadat Khana:* Established a *"House of Worship"* for religious discussions.
- *Sulh-i-Kul:* Introduced the policy of *"Universal Peace"* or religious tolerance.
- *Din-i-Ilahi (1582):* A new syncretic religion/code of conduct proclaimed by Akbar.
- It synthesized values from Islam, Hinduism, Jainism, Christianity, and Zoroastrianism.
- **Note:** Birbal was the only Hindu to follow this religion.
- **Failure:** It was not successful as a mass religion and failed after Akbar's death.
- *Abul Fazal* described Akbar as "Insan-e-Kamil" (Perfect Man).
- Jizya had been abolished by Akbar in 1564 AD.

Architecture Built by Akbar

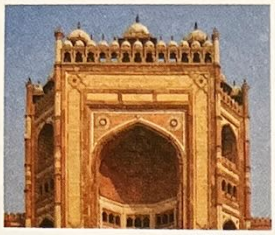
- *Agra Fort (1565 AD).*
- *Lahore Fort (1566 AD).*
- *Fatehpur Sikri (1570 AD):* Built in honor of Sufi Saint Salim Chisti. Capital shifted here from Agra (1571-1585).



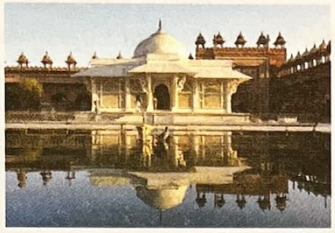
Agra Fort

- **Structures inside Fatehpur Sikri:**
  - *Buland Darwaza (1575 AD):* Built to commemorate his victory over the Gujarat expedition (1573 AD).
  - *Salim Chisti's Tomb:* Built by Akbar, but later redone in Marble by Jahangir.
  - **Other Palaces:** Palace of Birbal and Palace of Tansen (Akbar's Navratna) are also situated inside Fatehpur Sikri.
  - *Panch Mahal:* Also located in Fatehpur Sikri. Its Architectural pattern is based on Buddhist Vihara.
  - *Diwan-i-Khas:* Hall of Private Audiences, Built by Akbar.
- *Allahabad fort (1585 AD)*

> - *1569 AD:* Akbar's son Jahangir was born.
> - *1571 AD:* Akbar shifted capital from Agra to Sikri.
> - *1585 AD:* Capital shifted from Sikri to Lahore.
> - *1598 AD:* Capital shifted from Lahore to Agra.



Buland Darwaza, **(Fatehpur Sikri)**



Salim Chisti's tomb, **(Fatehpur Sikri)**

Navratnas of Akbar (Nine Jewels)

1. ***Birbal:*** Administrator/Wit (Original name: *Mahesh Das*).
2. ***Abul Fazal:*** Scholar and Statesman (Wrote *Akbarnama*).
3. ***Faizi:*** Scholar and Statesman (Brother of Abul Fazal).
4. ***Tordarmal:*** Finance Minister (*Dahsala Bandobast/Zabti*).
5. ***Fakir Aziao-Din:*** Advisor.
6. ***Man Singh:*** Mansabdar (Grandson of Bharmal).
7. ***Tansen:*** Musician.
8. ***Abdul Rahim Khan-e-Khana:*** Statesman (*Hindi poet*).
9. ***Mulla Do Pyaja:*** Advisor/Wit.

- Akbar started *Ibadatkhana* (religious discussion used to happen here).

> - ***Charbagh Style of architecture was introduced by Mughals in India.***
> - ***Humayun's Tomb (Aram Bagh, built by Akbar, is considered the first Mughal garden in India) was the first monumental building in India built in the Charbagh architectural style, where the garden is divided into four parts.***

> - ***Tansen originally served under Raja Ramchandra Singh (Tomar Dynasty, ruling in Gwalior). Tansen's original name was Ramtanu Pande and he belonged to Rewa/Gwalior Gharana. He composed Dhrupads and played Rudraveena (Rabab). He was also given "Miyan" title by Akbar.***

- *Abul Fazal* wrote *Akbarnama* (Biography of Akbar) that has three parts:
  - *1st:* It is about ancestors of Akbar.
  - *2nd:* It is about reign of Akbar.
  - *3rd: Ain-i-Akbari* (it is about his *administration* which was inspired from Sher Shah Suri).
- Akbar built a Translation Department *(Maktab Khana).*

Ramayana	*Abdul Qadir Badayuni*
Mahabharata (Razmnama)	*Faizi* and *Badayuni*
Lilavati (Bhaskaracharya's mathematical text)	*Faizi*

- All three were translated into Persian language.

Land Revenue System

→ Revenue was fixed based on the average yield of the land *over the past 10 years estimates* known as *Dahsala*, also known as Zabti system. It was introduced by Todar Mal.

- **The land was divided into 4 types:**

1. ***Polaj:*** The most fertile and productive land, cultivated regularly without being left fallow.
2. ***Parauti:*** Land left uncultivated for *1-2 years* to regain its fertility.
3. ***Chachar:*** Land left fallow for *3-4 years* before being cultivated again.
4. ***Banjar:*** Land that remained uncultivated for *5 years or more.*

Administration

He started Mansabdari system in 1571. The word Mansab means rank or position which determined the status, salary and number of soldiers the Mansabdars were required to maintain.

- Mansabs were graded on a numerical scale, with lowest rank being to *10* and highest reaching *5000 (later raised to 7000 and 10,000).*
- Each Mansabs were assigned *Zat*, representing their personal rank.
- Mansabdars were often payed in Jagirs (land assignments) from where they had the right to collect revenue from those lands.
- Military commanders in Akbar's empire: *Faujdars.*
- Mansabdars holding *1000* or above Sawar rank were designated as Nobles *(Umara).*

- Raja Man Singh had a Mansab of 7000 (Sapth Hajari).
- The Mansabdari system was not hereditary.
- Mansabdars were paid in cash or Jagirs (land assignments with revenue rights).

Last Expedition of Akbar

- Akbar defeated *Meeran Bahadur*, ruler of *Khandesh.*
- In *1601*, Akbar carried out his last expedition in *Fort of Aseergarh of Khandesh* (part of Ahmednagar). Akbar won, however his son Jahangir revolted against him.
- ***He died in:*** *1605* → *Tomb of Akbar in Sikandra, Agra.*

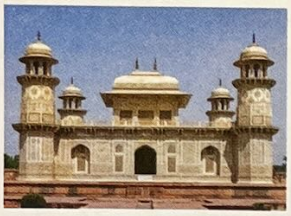
Jahangir (1605 AD-1627 AD)

- ***Original name:*** *Nur-ud-Din Muhammad Salim/Prince Salim* (son of Harka Bai).
- **Birth:** 1569 AD
- **Died:** 1627 AD
- ***Established:*** *Zanjir-i-Adal* (i.e. Chain of Justice) at *Agra Fort* for seekers of royal justice. Jahangir was known for his strict administration of justice.
- In *1611 AD*, he married *Mehr-un-Nissa* (widow of Sher Afghan, a Persian nobleman of Bengal)
  - Later known as *Nur Jahan.*
  - She was made official *Badshah Begum.*
  - She exercised tremendous influence over the state affairs.
  - Jahangir also issued silver coins in honour of his wife Mehr-un-Nissa.

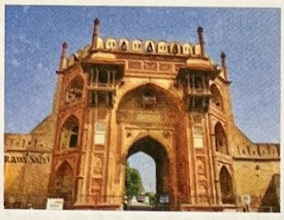
- He also married *Manmati Bai* (also known as Jagat Gosai) who was a Kachwaha princess. They gave birth to son *Prince Khurram* also known as *"Shah Jahan"*.

Architecture during his Reign

- The tomb of *Itimad-ud-Daulah*, built by *Nur Jahan* in fond memory of her father, inlaid with *Pietra Dura* decoration is located in *Agra*.
- The *Sarai of Nurmahal* is centrally protected monument of India, it is situated in Punjab constructed under the patronage of Nur Jahan.

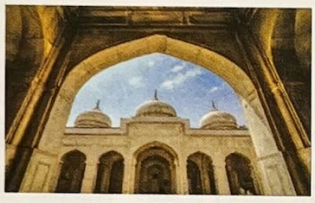


Tomb of Itimad-ud-Daula, Agra



The Sarai of Nurmahal, Punjab

- *Amar Singh* of *Mewar* accepted the suzerainty of Jahangir.
- In 1608 AD, he was visited by William Hawkins (a representative of British East India Company and was given Mansab of 400).
- In *1615 AD*, *Sir Thomas Roe* (an ambassador of *King James I* of England) came to his court.



Moti Masjid
Built by: *Jahangir in Lahore*

- Jahangir granted the English to establish a port in *Surat*.
- He captured a part of *Ahmadnagar* (Malik Amber ceded him the territory of Balaghat).
- Shah Jahan and Mahabat Khan (commander) revolted against him.
- He executed *5th Sikh Guru* → *Guru Arjan Dev* because he gave refuge to Jahangir's rebellious son *Khusrau*.

Memoirs Written

- Jahangir wrote his autobiography *"Tuzuk-i-Jahangiri"* in *Persian* language.

Biography

- Matumid Khan wrote the biography of Jahangir known as *"Iqbalnama-i-Jahangiri"*.

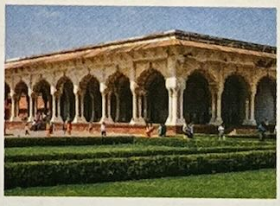
Shah Jahan (1628 AD-1658 AD)

- **Original Name:** *Prince Khurram*.
- ***Mother:*** *Jagat Gosai* (daughter of Raja Udai Singh).
- He is best known for his *Deccan* and foreign policies.
- ***Wife:*** *Mumtaz Mahal*.
  - Died in *1631*, 3 yrs after Shahjahan's accession to the throne.
  - ***Original name:*** *Arzumand Bano Begum*.
  - Shah Jahan built *Taj Mahal* in her memory in *Agra* in *1632 AD-1653 AD* (Ustad-Ahmad Lahori was the main architect of Taj Mahal).
- *1632 AD*, he defeated *Portuguese*.
- In *1637 AD*, he completely annexed *Ahmadnagar*.
- ***His reign is described by:***
  - French travellers *Bernier* (also a physician), *Tavernier* (he visited a total of 6 times) and *Italian traveller Niccolao Manucci*.
  - ***Bernier wrote:*** *"Travels in the Mogul Empire"*.
  - ***Tavernier wrote:*** *"Travels in India"*.
- He introduced new administrative unit called *Chakla* (placed between Subah and Pargana).
- **Hierarchy:**

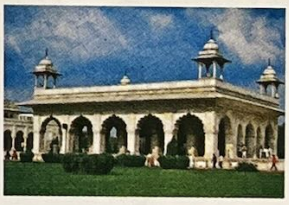
  Subah (Province) → *Chakla* (Division) → *Pargana* (District) → *Village* (Gram)
- *Peter Mundi* described famine that occurred during his reign.
- His reign is said to have marked *Pinnacle of Mughal Dynasty* (Known as the "Golden Age" for architecture).
- He is known to have promoted art, culture, and architecture.

Architecture Built by Shah Jahan

- **Red Fort (Delhi):** Built by *Shah Jahan* when he moved his capital from Agra to Delhi in 1638.
- Designed by architect *Ustad Ahmad Lahori*.



Diwan-i-Aam
(in Agra where common people gathered)



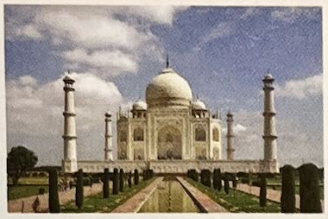
Diwan-i-Khas
(in Delhi was the hall where the Emperor and his inner circle of nobles sat)

Diwan-i-Aam (hall of public audience)

Builders	*Location*
Akbar and later by Shah Jahan	Agra (Agra Fort)
Shah Jahan (when he shifted Capital from Agra to Delhi in 1638)	Delhi (Red Fort)

Diwan-i-Khas (hall of private audience)

Builders	Location
Initially Akbar, further enhancement by Shah Jahan	Agra (Agra Fort)
Shah Jahan	Delhi (Red Fort)



Taj Mahal

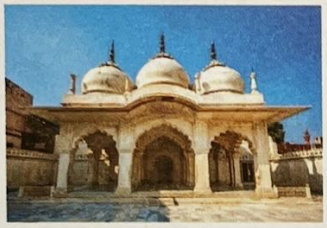
- Declared a UNESCO World Heritage Site in 1983.
- Popularized Pietra Dura (stone inlay work)

Mussman Burz in Agra

- It is also known as *Jasmine Tower* where he spent his last years in captivity.

Peacock throne

- Made in elevated part with 1100 kg gold (roughly).
- Also known as Takht-e-Taus.



Moti Masjid at Agra Fort

- It is made of white marble
- UNESCO World Heritage Site.
- Built by Shahjahan

The art of decoration called Pietra Dura became popular during the reign of Shah Jahan

Kohinoor Diamond

(Largest diamond in human history)

Sheesh Mahal

- Palace of mirrors.

- **The Kohinoor and the Peacock Throne, both were stolen by Nadir Shah who invaded in 1739 AD.**

Book

- *Padshahnama/Badshahnama* written by *Abdul Hamid Lahori* during his reign.
- In 1657 AD, his failing health set off the war of succession among his sons *Dara Shikoh, Aurangzeb, Murad Baksh*. In July 1658 AD, his son Aurangzeb emerged to be victorious.
- Aurangzeb imprisoned his father in *Agra Fort* where he died in captivity in 1666 AD. He was buried at *Taj Mahal* (Agra) next to his wife Mumtaz's tomb.

Reason for Shah Jahan's imprisonment

Shah Jahan formally confirmed *Dara Shikoh as his heir*, granting him the title of *Shahzada-e-Buland Iqbal* ("Prince of High Fortune") and wanted him to ascend the throne.

Aurangzeb (1658 AD-1707 AD)

- In 1658 AD, Aurangzeb defeated his elder brother Dara Shikoh (who was supported by Jaswant Singh of Marwar) in the following battles:
- In the Battle of *Dharmat(1658), Samugarh(1658), & Deorai(1659),* Aurangzeb emerged victorious and executed his brother Dara.
- ***After Victory:*** He was crowned at Delhi and assumed the title *"Alamgir"* (Conqueror of the World).
- Aurangzeb was known for his orthodox nature.
- He captured *Guru Teg Bahadur* (9th Guru of Sikhs) and executed him because Guru Teg Bahadur refused to embrace Islam.

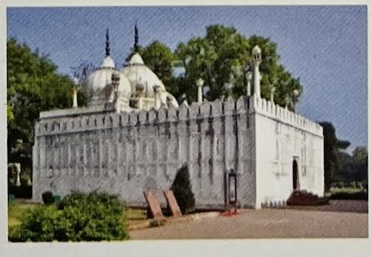
Deccan Conquest

- Aurangzeb moved to the Deccan in 1682 AD to control the region, which eventually led to the empire's decline.
- **Annexation:**

- Bijapur: Annexed in 1686 AD.

- Golconda: Annexed in 1687 AD.

- He appointed "*Muhtasibs*" (Censors of Public Morals) to enforce Islamic law and check un-Islamic practices.
- ***He wrote:*** *Fatwa-i-Alamgiri* (Muslim Laws).
- He re-introduced the Jizya tax on non-Muslims in 1679 AD.
- ***Death:*** *1707 AD* at *Devgiri, Aurangabad* (present day known as *Chhatrapati Sambhajinagar*).
- ***Buried at:*** *Khuldabad* (Daulatabad).
- He was called *"Zinda Pir"*, the living saint.



Moti Masjid

- ***Built by:*** Aurangzeb inside the Red Fort in Delhi

Bibi ka Maqbara

- **Located** in Aurangabad.
- ***Built by:*** Azam Shah (son of Aurangzeb) in fond memory of his mother Dilras Banu Begum who was posthumously named as Rabia-ud-Durrani.
- It is known as the "*Taj of the Deccan*".

Emperor	Location of tomb
Babur*	Kabul, Afghanistan
Humayun	Delhi, India
Akbar	Sikandra, Agra, India
Jahangir	Lahore, Pakistan
Shah Jahan	Agra, India
Aurangzeb	Near Aurangabad, Maharashtra
Bahadur Shah Zafar	Myanmar

* Babur was initially buried in Agra, later reinterred in Kabul as per his wish.

Later Mughals

Bahadur Shah *(1707 AD-1712 AD)*

- He is also known as *Shah Alam I* or *Muazzam*.

Jahandar Shah *(1712 AD-1713 AD)*

- He ascended to throne with the help of *Zulfiqar Khan*.
- He abolished *Jaziya*.
- He introduced the *Ijaradari System* (Land Revenue Farming).

Farrukh Siyar *(1713 AD-1719 AD)*

- He ascended the throne with the help of the Sayyid Brothers (Abdullah Khan & Hussain Ali Khan) who were also known as King Makers.
- In 1717, he issued the Golden Farman to the British East India Company, granting duty-free trade in Bengal on payment of an annual sum of ₹ 3,000 and permitting the Company to issue Dastaks (trade passes).
- *Sayyid Brothers* killed Farrukh Siyar with the help of *Marathas* (Peshwa Balaji Vishwanath).

Muhammad Shah *(1719 AD-1748 AD)*

- **Original Name:** *Roshan Akhtar*.
- He was also known as *"Rangeela"* due to his luxurious lifestyle.
- He killed the *Sayyid Brothers* with the help of *Nizam-ul-Mulk* (Chin Qulich Khan, who also founded Hyderabad).
- During his reign, governors declared independence:

- **Awadh:** Founded by Saadat Khan (Burhan-ul-Mulk).

Nadir Shah's Invasion (1739 AD)

- *Battle of Karnal:* Muhammad Shah called Nizam-ul-Mulk and Saadat Khan for help, but they were defeated and captured.
- Nadir Shah (Ruler of Iran - Afsharid dynasty) sacked Delhi and took away the Peacock Throne, Kohinoor Diamond and immense amount of wealth.
- This invasion was followed by a series of plundering raids by the Afghan ruler *Ahmad Shah Abdali*, who invaded north India *five times* between *1748 AD* and *1761 AD*.

Ahmed Shah *(1748 AD-1754 AD)*

- He faced repeated invasions by the Afghan ruler Ahmed Shah Abdali.

Alamgir II *(1754 AD-1759 AD)*

- He was also killed by nobles.
- The famous *Battle of Plassey (1757)* was fought during his reign.

Shah Alam II *(1759AD-1806AD)*

- He was blinded by his nobles.
- *Battle of Buxar (1764):* He fought against the British and lost.
- *Treaty of Allahabad (1765):* He granted the Diwani rights of Bengal to the British.

Akbar II *(1806 AD-1837 AD)*

- He gave the title of "*Raja*" to the social reformer *Ram Mohan Roy*.

Bahadur Shah II *(1837 AD-1857 AD)*

- The last Mughal ruler.
- Known as *Bahadur Shah Zafar*.
- He was deported after the *Revolt of 1857* and sent to *Rangoon*.

Administration

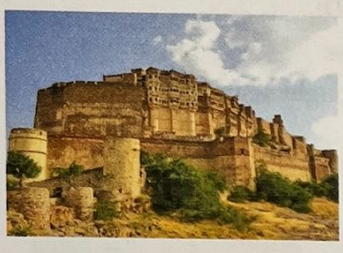
- Suba was divided into Sarkar which was further divided into Pargana and Gram .
- *Suba:* Province (Headed by *Subedar / Nizam*).
- *Sarkar:* District (Headed by *Fauzdar*).
- *Pargana:* Taluka (Headed by *Shiqdar & Amil*).
- *Gram:* Village (Headed by *Muqaddam*).

Important Officers

- *Mir Saman:* In charge of Royal Household.
- *Mir Bakshi:* Head of Military Department.
- *Diwan:* Head of Revenue Administration.
- *Fauzdar:* Maintained law and order.
- *Amalguzar:* Responsible for assessment and collection of land revenue.
- *Sadr:* Managed judicial affairs.
- *Shiqdar:* Police Chief at Pargana level.
- *Amin:* A revenue assessor at the Pargana level.
- *Kotwal:* Chief of City police
- *Qanungo:* Local revenue officer

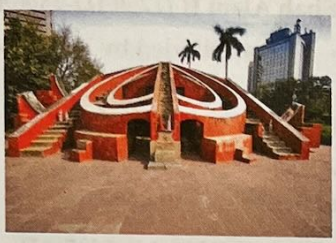
RAJPUTS

- Many Rajput kings, particularly those belonging to Amber and Jodhpur, had served under the Mughals with distinction.
- In exchange, they were permitted to enjoy considerable autonomy as *Watan Jagirs*.
- These influential Rajput families claimed the subadari of rich provinces of Gujarat and Malwa.
- *Raja Ajit Singh* of *Jodhpur* held the governorship of *Gujarat* and *Sawai Raja Jai Singh II* of *Amber* was the governor of *Malwa*.
- Sawai Raja Jai Singh II founded his new capital at *Jaipur* and was given the *Subadari of Agra* in *1722 AD*.



Mehrangarh Fort

- ***Built by:*** Rao Jodha (Rathore ruler of Marwar).
- It is in Jodhpur (known as Blue City).



Jantar Mantar

- ***Built by:*** Sawai Jai Singh II of Jaipur
- Total 5 Jantar Mantars built by him in: Delhi (1st to be built), Jaipur (largest), Varanasi, Ujjain, Mathura.

REGIONAL RESISTANCE (MUGHAL VS REBELS)

Raja Chhatrasal (Bundelkhand Region)

- His father, *Champat Rai*, was killed by the Mughals near Mahoba (during Aurangzeb's time).
- Chhatrasal was only 12 years old at that time.

The Meeting with Shivaji (Age 20)

- Young Chhatrasal met Chhatrapati Shivaji Maharaj, who inspired him to fight for his own people's freedom & also taught him *guerrilla warfare* tactics.

The Struggle Begins (Age 22 - 1671 AD)

- Chhatrasal started his revolt with a tiny army.
- Using guerrilla tactics, he harassed the Mughals so much that they could not catch him.
- **Mughal Compromise (1705 AD):** Frustrated, *Aurangzeb* eventually offered him a *Mansab of 4,000* to maintain peace.

The Bangash Invasion & Bajirao (1728 AD)

- After Aurangzeb died, Chhatrasal declared Independence (approx 1720).
- **The Conflict:** The Mughal Governor *Muhammad Khan* Bangash attacked Bundelkhand.
- Despite fighting bravely, the 80-year-old Raja Chhatrasal was surrounded and forced to retreat to *Jaitpur*.
- Chhatrasal sent a message to Peshwa Bajirao I for help. Bajirao I defeated Bangash, who was forced to retreat and promise never to return.
- **Reward:** Raja Chhatrasal gave *Bajirao*:
  - *1/3rd* of his Kingdom (Jhansi, Sagar, Kalpi).
  - His daughter, *Mastani*.

Battle of Saraighat (1671)

- It was fought between: *Mughals* and the *Ahom Kingdom*, on the banks of the *Brahmaputra River* (Guwahati, Assam).
- The Ahom forces were led by *Lachit Borphukan* and the Mughal forces were led by *Raja Ram Singh* (under Emperor Aurangzeb).
- Mughals were defeated.

MARATHA STATE (1674 - 1720) AND MARATHA CONFEDERACY (1720 - 1818)

Shivaji (1674-1680)

- *Born at: Shivneri Fort in 1630.*
- *Death: 1680.*
- *Father: Shahji Bhonsle.*
- *Mother: Jija Bai.*
- *Religious teacher: Samarth Ramdas.*

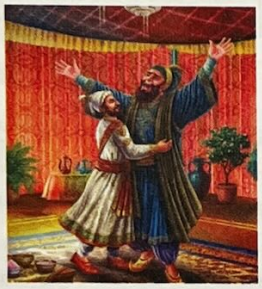
Early Conquests & Military Tactics

- At the young age of 16, Shivaji captured the *Torana Fort* (first victory) and renamed it Prachandagad (meaning '*Massive Fort*').
- Shivaji mastered the art of Guerrilla Warfare (known as *Ganimi Kava*). He used the rugged terrain of the Sahyadri mountains to launch surprise attacks and defeat much larger Mughal armies.

Ghode Modni: A folk dance of Goa celebrating Maratha victory

Expeditions of Shivaji

Battle of Pratapgarh (1659)



Shivaji killing Afzal Khan using Wagh Nagh

- The battle was fought between the Maratha forces led by *Shivaji* and the *Bijapur troops* under *General Afzal Khan*, (representing *Adil Shah*) to crush Shivaji's rising power.
- Shivaji defeated Afzal Khan through brilliant counter-strategy called *Wagh Nagh* marking the Marathas' first major victory.

Conflict with Shaista Khan (1660 – 1663)

- Shaista Khan *(Governor of Deccan)* was deputed by Aurangzeb to put down rising power of Shivaji in 1660 (Shivaji lost Poona but later made a bold attack against him in 1663 and plundered *Surat (1664)* and later *Ahmadnagar*).

Treaty of Purandar (1665)

Raigad Fort

- In *1665 AD*, *Aurangzeb* appointed *Raja Jai Singh I* of Amber to lead a campaign against Shivaji, resulting in the *Treaty of Purandar*. Shivaji agreed to give his *23 out of total 35 Forts* to Mughals.
- **Agra Visit & Escape (1666 AD):** Shivaji visited Aurangzeb's court in Agra but was insulted and imprisoned.
- He famously escaped later that year (legend says by hiding in a basket of sweets).

Naval forts erected by Shivaji :

- *Suvarnadurg*
- *Sindhudurg*
- *Vijayadurg*
- *Kolaba*

Battle of Salher (1672)

- Maratha forces led by Shivaji (commanded by *Prataprao Gujar* and *Moropant Pingle*) defeated Mughal army.
- In 1674 AD, Shivaji proclaimed himself "*Chhatrapati*" at his coronation ceremony held at Raigad Fort.

Administration

- The Ashtapradhan System (Council of 8 Ministers):
  1. *Peshwa:* Prime Minister (Head of Administration).
  2. *Amatya:* Finance Minister (Managed Treasury).
  3. *Mantri (Waqia-Navis):* Interior Minister (Intelligence/ Home).
  4. *Sachiv (Shurunavis):* Secretary (Drafted Royal Orders).
  5. *Sumant:* Foreign Minister (Diplomacy).
  6. *Senapati:* Commander-in-Chief (Military Campaigns).
  7. *Panditrao:* High Priest (Religious Affairs).
  8. *Nyayadhyaksha:* Chief Justice (Judicial Matters).
- Shivaji introduced *Marathi* in place of Persian and coined *Sanskrit* technical terms for administrative purposes.

Revenue Sources

Literary Texts language which Maratha used: Modi Script

- The Marathas collected specific taxes from territories outside their direct control(Swarajya).
- *Chauth:*
  - Meaning: "*One-Fourth*" (1/4th).
  - Rate: *25%* of the land revenue.
  - Purpose: It was a *protection tax*. Territories paid this to avoid Maratha raids.
- *Sardeshmukhi:* An *additional 10%* tax imposed on top of Chauth.
  - Purpose: Collected in areas where Marathas claimed hereditary rights *(Sardeshmukh)* or where their troops were stationed.

Sambhaji (1681-1689)

- He was the *eldest son* of *Shivaji* and *Saibai*.
- He defeated *Rajaram*, his younger brother in the war of succession.
- He also provided protection and support to *Mirza Akbar*, the rebellious son of *Aurangzeb* due to which he gave gruesome death to Sambhaji.
- He successfully attacked and raided Burhanpur (MP).
- He fought against the Portuguese and captured Goa and Konkan regions from them.

Rajaram (1689-1700)

- He was the son of *Shivaji* and *Soyarabai*.

- He succeeded the throne with the help of ministers at Rajgarh.
- ***He created a new post:*** ***Pratinidhi*** {Total no. of ministers now nine ***(Pratinidhi + Ashtapradhan)***}.
- He died in ***Satara*** which became the capital after the fall of ***Jinji*** to Mughals ***(1698)***.

Tarabai

- She was the wife of Rajaram and regent for son ***Shivaji II***.
- Led resistance against Mughals.

Shahuji (1708-1749)

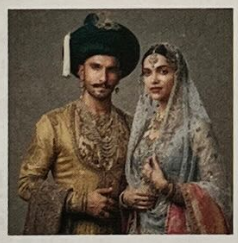
- He was the son of Sambhaji.
- He was released by Mughal Emperor ***Bahadur Shah***.
- ***Battle of Khed (1707):*** Shahu defeated Tarabai with the help of Balaji Vishwanath to claim the throne.

Balaji Viswanath (1713-1720)

- In 1713, he became the ***first Peshwa*** (PM of Marathas).
- He began his career as small revenue official and was given the title ***"Senakarte"*** (Maker of the Army) by ***Shahu*** in ***1708***.
- The Peshwaship became a hereditary position from his reign.

Baji Rao I (1720-1740)

- He was the ***eldest son*** of Balaji Viswanath.
- ***He defeated:*** ***Nizam-ul-Mulk*** or ***Asaf Jah I (Khan Siddiqi, the first Nizam of Hyderabad)***.
- ***He signed:*** ***Treaty of Doraha Sarai*** with ***Jai Singh*** after a victory over a combined force of the ***Nizam, Awadh,*** and ***Rajput*** states of ***Jaipur*** and ***Kota***.
- In 1737, he raided Delhi.
- During Baji Rao I's tenure, the concept of the ***Maratha Confederacy*** emerged.
- He never lost a single battle in his entire life.
- ***Son:*** ***Balaji Baji Rao***.



Baji Rao I captured Bassein from Portuguese in 1739.

Balaji Baji Rao (1740-1761)

- He is also known as ***Nana Saheb***.
- During his tenure, the ***3rd Battle of Panipat*** was fought between ***Marathas*** and ***Afghans*** in 1761. ***Peshwa Sadashivrao Bhau*** led the Maratha army and ***Ahmad*** Shah ***Abdali*** from ***Durrani Empire***, led the Afghan forces. The ***Marathas lost*** the battle (One of the deadliest battles).

Indo-Saracenic architecture is a 19th-century British colonial style that merged Indo-Islamic and Hindu design elements with British Gothic Revival and Neo-Classical styles. Examples: Mysore Palace, Chhatrapati Shivaji Maharaj Terminus (Mumbai). Victoria Memorial (Kolkata), and the Albert Hall Museum (Jaipur).

Anglo-Maratha Wars

1st Anglo-Maratha War *(1775-1782)*

- This was started due to an internal conflict. ***Raghunath Rao***, brother of Balaji Baji Rao wanted to become Peshwa. However, ***Nana Fadnavis*** (Finance Minister) didn't want him to become Peshwa.
- This war began when Raghunath Rao signed the Treaty of Surat (1775) and later the Treaty of Purandar (1776) with the British to gain support to become Peshwa.
- The Britishers were defeated initially and ***Treaty of Wadgaon (1779)*** was signed.
- Subsequently, Britishers attacked again under the leadership of Warren Hastings and defeated Marathas. ***Treaty of Salbai (1782)*** was signed at the end.

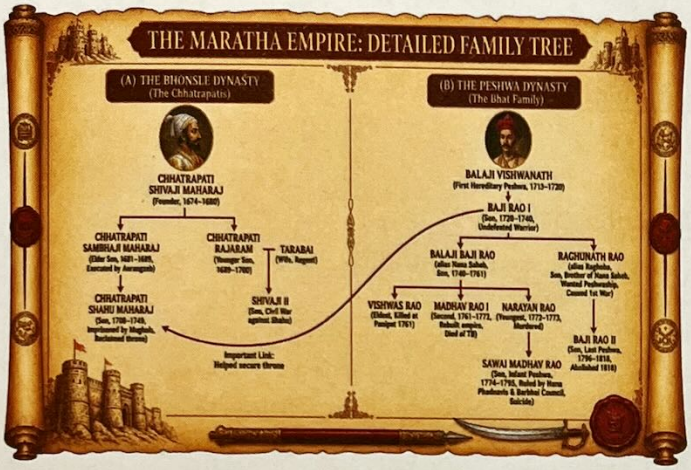
2nd Anglo Maratha War *(1803-1805)*

- British Leadership:
- Deccan: Led by ***Arthur Wellesley***.
- North India: Led by ***General Lake***.
- ***Baji Rao II*** signed a subsidiary alliance with the British in the form of ***Treaty of Bassein (1802)*** which led to the 2nd Anglo-Maratha War. This war was ***won by British***.
- The 2nd Anglo-Maratha War ended with signing of ***Treaty of Rajghat (1805)*** with ***Holkars***.
- The ***Treaty of Deogaon*** signed after ***Battle of Argaon*** during 2nd Anglo-Maratha War ***(1803)*** with ***Bhonsles Dynasty***. Cuttack was acquired by Britishers after this war.

3rd Anglo-Maratha War *(1817-1818)*

- This war is often regarded as ***"Pindari War"***.
- Pindaris were ***tribal people*** that supported Marathas during ***raids***.
- ***Baji Rao II*** was captured and sent to ***Bithoor*** (Kanpur).
- ***Treaty of Mandsaur (1818)*** signed between the British and the ***Holkar chief***.
- From 1818, ***Peshwaship was abolished***.

The Maratha Military Landscapes of India were inscribed on the UNESCO World Heritage List in 2025 as India's 44th World Heritage Site.



BHAKTI MOVEMENTS

Main Features of Bhakti Movement

1. The Bhakti saints opposed complicated rituals, sacrifices, and strict rules followed by traditional priests.
2. They promoted *Monotheism* → Worship of single God.
3. *Saguna Hindu sects worshipped God in a specific form and Nirguna sects believed that God has no form.*

The Saguna sects were divided into two major branches:

1. ***Vaishnavism:*** They worshipped *Lord Vishnu* or his incarnations and were called *Alvars (First female Alvar* was *Andal*, she was a propounder of *Bhakti Movement*). There were 12 Alvars of Vaishnavism.
2. ***Shaivism:*** They worshipped *Lord Shiva* and were called *Nayanars*. Nayanars were a group of *63 Tamil Saints* out of which 3 were females: *Karaikkal Ammaiyar, Mangayarkkarasiyar* and *Isaignaniyar*.

→ *Kapalikas, Kalamukhas* and *Nathas* are sects of Shaivism while *Sahajiyas* is a sect of Vaishnavism.

- ***Lord Vishnu has 10 avatars → Matsya, Kurma, Varaha, Narasimha, Vamana, Parashurama, Rama, Krishna, Buddha, and Kalki.***
- ***Chariot: Garuda (National emblem of Indonesia).***

Philosophy and Founder

Philosophy	*Founder*
Vishishtadvaita	Ramanuj Acharya
Dvaitadvaita / Bhedabhed	Nimbark Acharya
Dvaita	Madhva Acharya
Shuddhadvaita	Vallabhachariya
Advaita	Sri Adi Shankaracharya

- ***Shuddhadvaita teaches that the world is real and emphasizes worship through idols.***
- ***Sri Shankaracharya believed this life and world is a myth and did not support idol worship.***

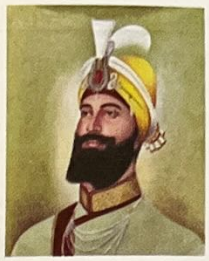
Bhakti Movement Saints

Kabir (1440-1510)

- He was born in *Varanasi*.
- He was a disciple of *Ramananda*.
- Kabir's Doha often *criticises Hindu* or *Islamic Dharma* pointing out the contradictions and superficialities in both religions.
- He belonged to *Nirguna sect*.
- *Bijaka is a compilation of the preachings by Kabir.*

Ramananda (14th-15th Century)

- He belonged to *Nirguna* sect from *North India*.
- *Kabir Das* was his disciple.



Guru Gobind Singh Sahib

Guru Nanak (1469-1538)

- He belonged to *Nirguna sect* and *Khatri community*.

Vallabhacharya (1479-1531)

- He gave *Shuddhadvaita* philosophy.
- He gave the philosophy of *"Pushti Marg"*.
- He said *"Ram and Krishna are avatars of Vishnu"*.

Vidyapati (14-15 century)

- He composed *Padavali (love ballads of Krishna and Radha)*.

Chaitanya (1486-1533)

- He propounded Bhakti Movement in *Bengal* (known as *Bengal Vaishnavism*).
- He is known as *"King of Gaudiya"*. He founded *Gaudiya Vaishnavism*.

Purandar Das (1480-1564)

- He is known as *"Father of Carnatic music" (South Indian music)*.

Mirabai (1498-1546)

- *Disciple of: Raidas/Ravidas*
- She was daughter-in-law of *Rana Sanga* of Mewar.
- She was a *Rathore princess*.
- She was a *bhakt of Krishna*.

Surdas (1483-1563)

- He was blind.
- He belonged to Agra.
- He dedicated his lifetime in *bhakti of Krishna*.

Tulsi Das (1532-1623)

- He was a *bhakt of Ram*.
- *Famous writings: Ramcharitramanas, Kavitawali, Gitawali.*

Dadu Dayal (1544-1603)

- He belonged to *Nirguna sect*.
- He is the founder of *Dadu Panth*.

Sankaradeva (1449-1568)

- He spread Bhakti Movement across *Assam*.
- He is the founder of *Sattriya dance*.
- He gave *Borgeet*.

Thyagaraja (1767-1847)

- He was from *Tamil Nadu*.
- He was a *bhakt of Rama*.

Bhakti Saints of Maharashtra

Jnanesvara/Jnanadeva (1271-1296)

- He was the founder of Bhakti Movement in *Maharashtra*.
- He wrote commentary on *Bhagvad Geeta (Bhavarthadipika)*.
- He composed *Abhangas*.

Namadeva (1270-1350)

- He was the founder of *Varkari sect*.
- The followers of Varkari sect worshipped *Vitthal (a form of Lord Vishnu worshipped in Maharashtra)*.

Ramdas (1608-1681)

- He wrote *Dasabodha (compilation of his sermons)*.

Bhakti Saints of Karnataka

Basavana

- He founded *Lingayat/Virshaiva sect*.
- He initially was a Jaina and a minister in the court of a *Chalukya king* in the *12th Century*.
- He was a believer of *Lord Shiva (he believed in Monotheism)*.
- He was against caste system/Vedic rituals.

SIKH GURUS

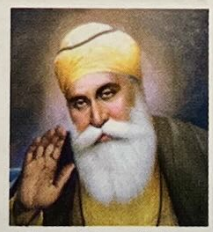
Era of Sikhism

Sikhs believed in three things that could abolish Untouchability.

They were:

- ***Langar: Community kitchen***
- ***Pangat: Eating***
- ***Sangat: Decision making***

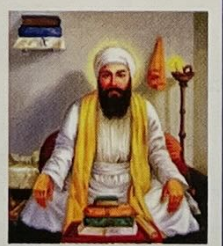
Guru Nanak Dev (1469-1539)



Guru Nanak Dev

- ***Birth:*** 1469, *Nankana Sahib* (present day: *Pakistan*)
- He founded the Sikh faith.
- ***Death:*** *Kartarpur (Pakistan)*
- He started the institution of *"Guru Ka Langar"*.
- He was contemporary to the Mughal emperor *Babur*.

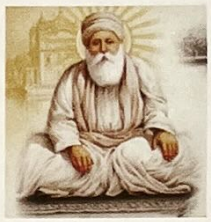
Guru Angad Dev (1539-1552)



Guru Angad Dev

- He created and introduced the *Gurmukhi* (written form of *Punjabi*) script.
- He compiled the *writings of Nanak Dev in Guru Granth Sahib* in Gurmukhi Script.
- He started *Mall Akhara (wrestling arena) system*.

Guru Amardas Sahib (1552-1574)



Guru Amardas Sahib

- He introduced the *Anand Karaj* marriage ceremony for the Sikhs.
- He established *Manji* and *Piri* system of religious missions for men and women respectively.
- He was contemporary to the Mughal emperor Akbar.

Guru Ram Das (1574-1581)

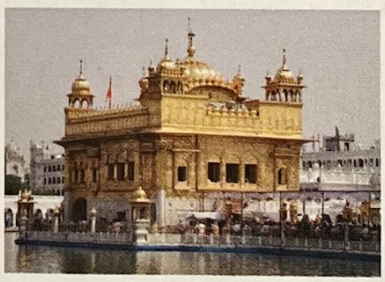
Guru Ram Das

- He founded the city of *Amritsar (the holy city of the Sikhs)*.

Guru Arjan Dev (1581-1606)

Guru Arjan Dev

- He compiled the *Adi Granth* → the scriptures of the Sikhs.
- He started the construction of the famous *"Golden Temple"* at Amritsar.
- He requested the Muslim Sufi → *Mian Mir* to lay the cornerstone of the *Harmandir Sahib*.
- He completed construction of *Sri Darbar Sahib (Golden Temple)*.
- *Jahangir* ordered his execution, because he gave shelter to *Khusrau* (rebellion son of *Jahangir*), thus he was hailed as *Shaheedan-de-Sartaj (the crown of martyrs)*.



Sri Harmandir Sahib Golden Temple

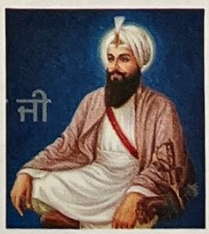
- Gold plating of this temple was done by Maharaja Ranjit Singh

Guru Har Gobind Sahib (1606-1644)

Guru Har Gobind Sahib

- ***Son of:*** Guru Arjan Dev and he was also known as a *"Soldier Saint"*.
- He is the *first Sikh Guru to take up arms* to defend the faith.
- He waged wars against Mughal rulers *Jahangir* and *Shah Jahan*.
- He established *Akal Takht*.

Guru Har Rai Sahib (1644-1661)



Guru Har Rai Sahib

- He gave shelter to *Dara Shikoh*, the eldest son of Mughal Ruler *Shah Jahan*.
- He avoided conflict with Emperor Aurangzeb and devoted his efforts to missionary work.

Guru Har Krishan Sahib (1661-1664)

Guru Har Krishan Sahib

- Guru Har Krishan was the *youngest* of the Gurus *(became the leader at the age of 5 years)*.
- He was *contemporary of Aurangazeb* and was summoned to Delhi by him under framed charges of Anti-Islamic blasphemy.
- ***Death due to:*** Smallpox

Guru Tegh Bahadur Sahib (1665-1675)

Guru Tegh Bahadur Sahib

- He established the town of *Anandpur*.
- He was killed by Aurangzeb in *1675* because he resisted the forceful conversion of *Hindu Kashmiri Pandits*.

Guru Gobind Singh Sahib (1675-1708)

- He established *Khalsa Panth* in *13 April 1699 (on Vaisakhi)*, changing the Sikhs into a saint-soldier order to protect themselves.
- He was the last of Sikh Gurus in human form and he passed the Guruship of the Sikhs to the Guru Granth Sahib.
- He was assassinated by two Afghans, sent by *Wazir Khan* (Mughal ruler of Sirhind).
- He was succeeded by *Banda Bahadur (not a Sikh Guru)*, who was killed by Farrukhsiyar.

Guru Granth Sahib

- Guru Granth Sahib (also known as the *Adi Granth*) is the scripture of the Sikhs.
- The Granth was written in *Gurmukhi script* and it contains the actual words and verses as uttered by the Sikh Gurus.
- *It is considered the supreme spiritual authority and head of the Sikh religion, rather than any living person.*

SUFI MOVEMENTS

Origin of Sufi Movements

- In early Islamic teachings, some believed that a *Dar al-Harb (Land of War)* could become a *Dar al-Islam (Land of Islam)* through *Jihad*, which means striving or struggle. They also believe that Mujahid (one who engages in Jihad) attains Jannat on Jihad.
- This set of belief was changed by Sufi saints.

Khwaja Ali Hujjwiri (11th Century)

- He is also known as *"Data Ganj Baksh"*.

Shaikh Bahauddin Zakaria (1182-1262)

- He founded the leading *Khanqah* in India at Multan.
- He was the founder of *Suhara-Wardi* order.

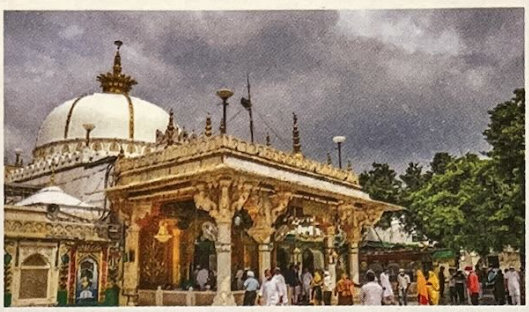
The Naqshbandi Silsila is a chain of succession in the Naqshbandi Sufi order of Sunni Islam.

Khwaja Moinuddin Chisti (1141-1236)

- He was the founder of the *Chisti* order.

Other Saints of Chisti Order

- ***Sheikh Hamiduddin Nagauri (1192-1274)***

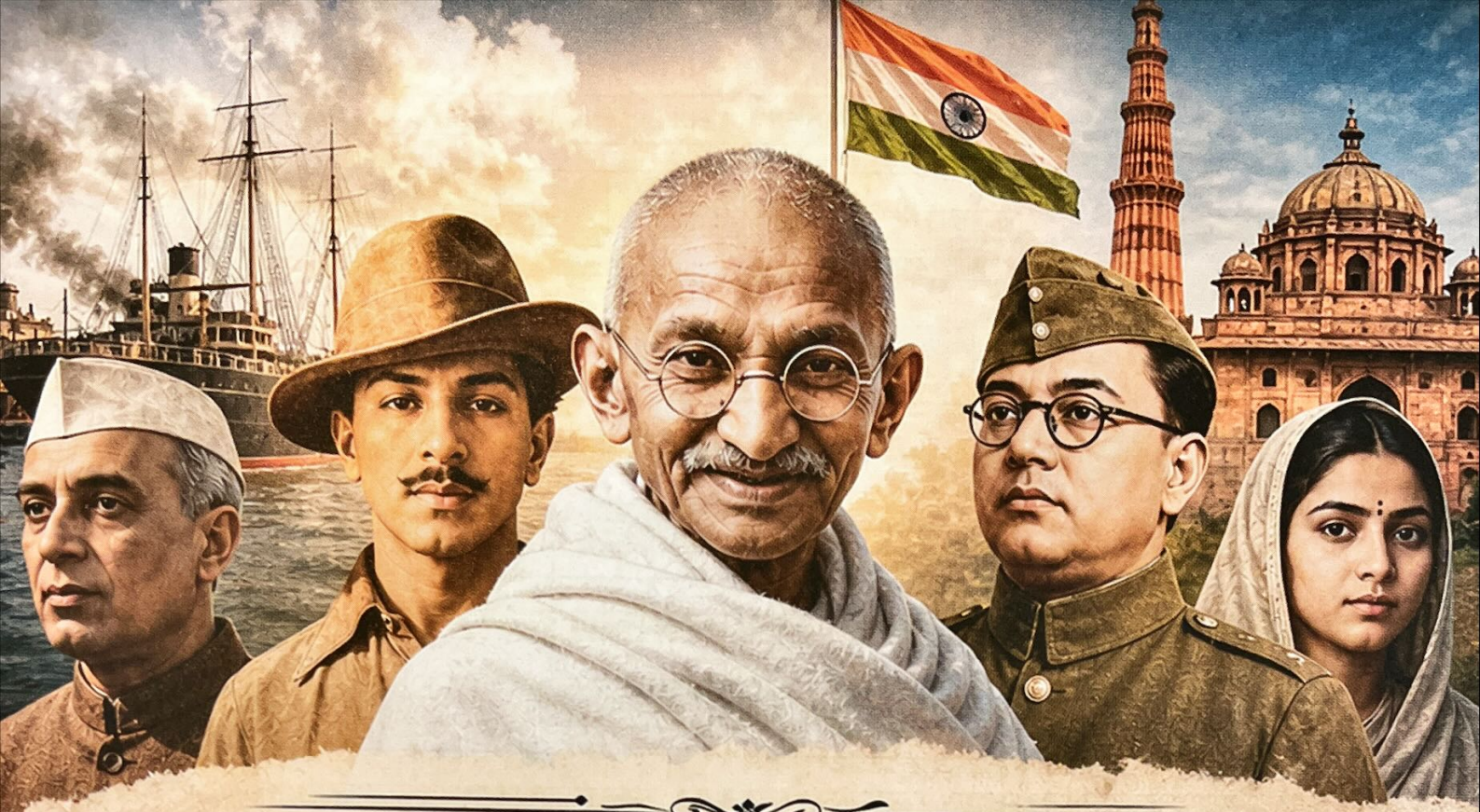


Ajmer Sharif

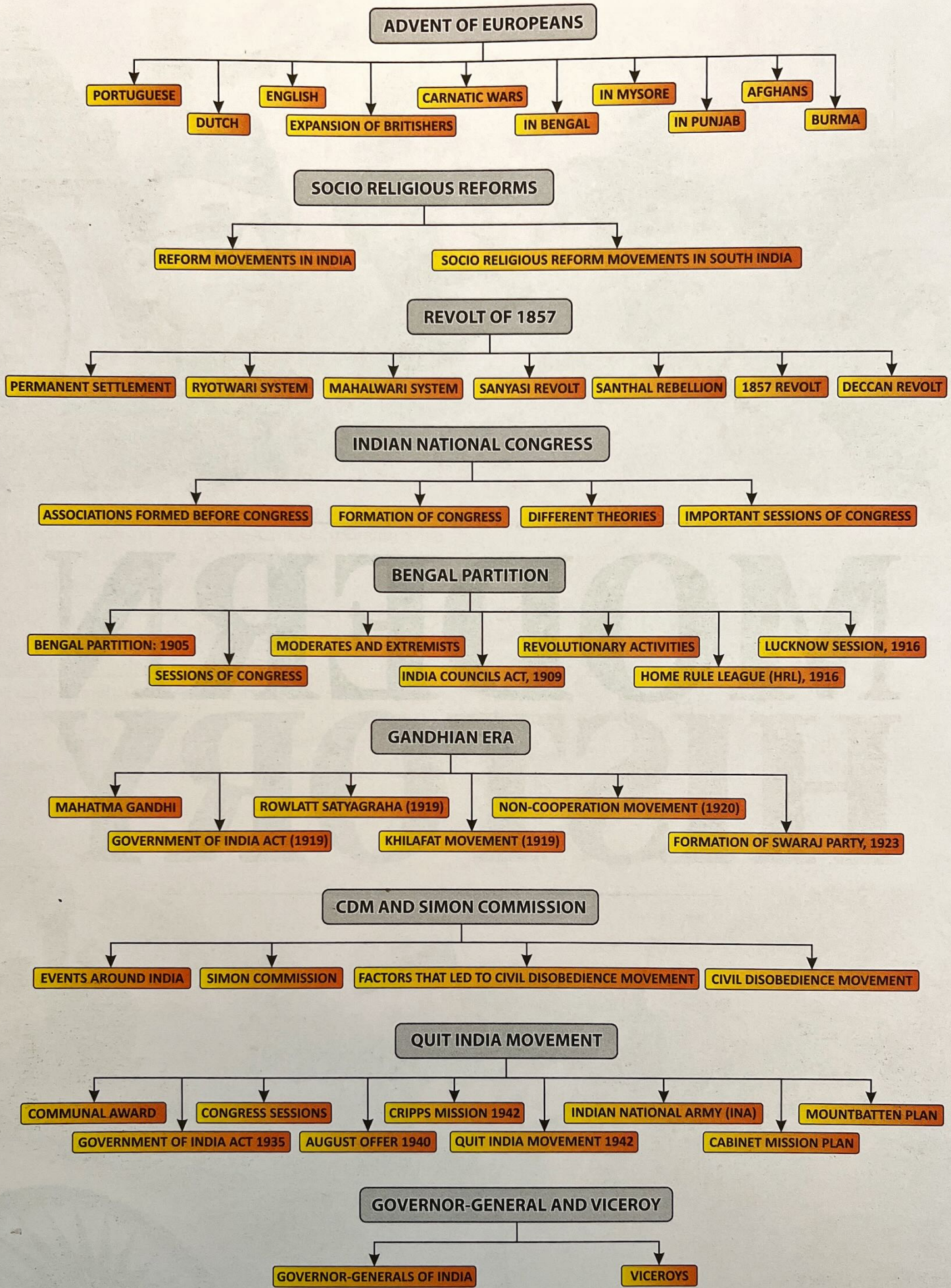
- Ajmer Sharif, built in honour of *Khwaja Moinuddin Chisti*. Mohammad Bin Tuglaq was the first Sultan to visit Ajmer Sharif.
- ***Khwaja Qutubuddin Bhaktiyar Kaki***
  - ***Disciple:*** *Qutubuddin Aibak*, who started the construction of *Qutub Minar* on his name *(1206)*
- ***Baba Jariuddin/Ganj-i-Shankar (1175-1265)*** → He is popularly known as Baba Farid.
- ***Shaikh Nizamuddin Auliya (1236-1325)*** → He is popularly known as Mehboob-i-Illahi.
- ***Syed Muhammad Gesu Daraz*** → Popularly known as Bandanawaz.
- ***Shaikh Nasiruddin Mahmud*** → He was later known as Chirag-i-Delhi.
- ***Shaikh Badruddin Samarkandi (13th Century)*** → He founded Firdausi Order.

Sufi Words and their Meanings

Sufi Words	*Meaning*
Tasawwuf	Sufism
Shaikh/Pir/Murshid	Spiritual teacher
Murid	Disciple
Khalifah	Successor
Khanqah	The hospice (house of resting)
Sama	Musical recital
Raksa	Dance
Fana	Self annihilation
Ziyarat	Pilgrimage to the tombs of Sufi Saints



MODERN HISTORY


ADVENT OF EUROPEANS
PORTUGUESE
DUTCH
ENGLISH
EXPANSION OF BRITISHERS
CARNATIC WARS
IN BENGAL
IN MYSORE
IN PUNJAB
AFGHANS
BURMA
SOCIO RELIGIOUS REFORMS
REFORM MOVEMENTS IN INDIA
SOCIO RELIGIOUS REFORM MOVEMENTS IN SOUTH INDIA
REVOLT OF 1857
PERMANENT SETTLEMENT
RYOTWARI SYSTEM
MAHALWARI SYSTEM
SANYASI REVOLT
SANTHAL REBELLION
1857 REVOLT
DECCAN REVOLT
INDIAN NATIONAL CONGRESS
ASSOCIATIONS FORMED BEFORE CONGRESS
FORMATION OF CONGRESS
DIFFERENT THEORIES
IMPORTANT SESSIONS OF CONGRESS
BENGAL PARTITION
BENGAL PARTITION: 1905
SESSIONS OF CONGRESS
MODERATES AND EXTREMISTS
INDIA COUNCILS ACT, 1909
REVOLUTIONARY ACTIVITIES
HOME RULE LEAGUE (HRL), 1916
LUCKNOW SESSION, 1916
GANDHIAN ERA
MAHATMA GANDHI
GOVERNMENT OF INDIA ACT (1919)
ROWLATT SATYAGRAHA (1919)
KHILAFAT MOVEMENT (1919)
NON-COOPERATION MOVEMENT (1920)
FORMATION OF SWARAJ PARTY, 1923
CDM AND SIMON COMMISSION
EVENTS AROUND INDIA
SIMON COMMISSION
FACTORS THAT LED TO CIVIL DISOBEDIENCE MOVEMENT
CIVIL DISOBEDIENCE MOVEMENT
QUIT INDIA MOVEMENT
COMMUNAL AWARD
GOVERNMENT OF INDIA ACT 1935
CONGRESS SESSIONS
AUGUST OFFER 1940
CRIPPS MISSION 1942
QUIT INDIA MOVEMENT 1942
INDIAN NATIONAL ARMY (INA)
CABINET MISSION PLAN
MOUNTBATTEN PLAN
GOVERNOR-GENERAL AND VICEROY
GOVERNOR-GENERALS OF INDIA
VICEROYS

Order of Advent of Europeans in India

1. *Portuguese (1498)*
2. *Dutch (1602)*
3. *English (1608)*
4. *Danes (1616)*
5. *French (1668)*

PORTUGUESE

Arrival of Portuguese

- The Portuguese came to India for various economic and religious reasons. They were the *first to introduce tobacco and cashew nuts* in India. They were the first to arrive and the last to leave. Goa was liberated in 1961.

Vasco da Gama *(1498)*

- Vasco da Gama was the first to discover the sea route to India via the *Cape of Good Hope*.
- He was a Portuguese explorer who came to *Calicut* in 1498 during the rule of *King Zamorin* (then Hindu ruler).
- He reached Calicut aboard the Portuguese ship São *Gabriel*, guided by an *Arab navigator* named *Ahmad ibn Majid (Ibn Majid)*.

Treaty of Tordesillas, signed on 7th June 1494 was a significant agreement between Spain and Portugal. It aimed to resolve conflicts over newly discovered lands by dividing the world into two spheres of influence. The treaty established a demarcation line, with lands to the east belonging to Portugal and lands to the west to Spain.

Francisco de Almeida *(1505)*

- He was the *first Portuguese Viceroy of India*.
- He brought *"Blue Water Policy"* (Cartaz System) which was a trade licensing system that allowed the Portuguese to control trade in *Indian Ocean*.

Afonso de Albuquerque *(1509)*

- He was the *second Portuguese Governor of India*. He is considered as the real founder of Portuguese power.
- He captured Goa in 1510 (from Adil Shah of Bijapur) and abolished *Sati*.
- He received permission to build a fort at *Bhatkal* from Krishnadevaraya.

Nuno da Cunha

- He was a Portuguese Governor who moved capital from *Cochin* to *Goa in 1530*.

Bahadur Shah, ruler of Gujarat surrendered Diu to Portuguese in 1535.

DUTCH

Arrival of Dutch

- Dutch refers to *"people from Netherlands"*.
- Dutch East India Company was formed in *1602*.
- They set up their first factory in *Masulipatnam* (Machilipatnam) in Andhra Pradesh in *1605*.

ENGLISH

Arrival of English

- *1599:* East India Company came into existence.
- *1600:* East India Company received a *Royal Charter* from *Queen Elizabeth I* to trade in India.
- *1608: William Hawkins* was sent by *King James* I of England and arrived at the court of Jahangir.
- *1611:* First factory at Masulipatnam (temporary).
- *1613:* First factory at Surat (permanent).
- *1615: Sir Thomas Roe* visited the court of Jahangir (arriving on the English ship *Hector*) to obtain official trading rights for the English East India Company.

- *1620:* Danes established their first factory at *Tranquebar* (Tamil Nadu).
- *1668:* French established their first factory at *Surat*.

EXPANSION OF BRITISHERS

- *Battle of Swally/Suvali (1612):* Fought in Surat. The British defeated the Portuguese.
- *Battle of Chinsurah/Bedara/Hooghly (1759):* Fought on the banks of the Hooghly River. The British defeated the Dutch.

Battle of Colachel in 1741 between Marthanda Varma (King of Travancore) and Dutch East India Company. The Dutch were defeated.

CARNATIC WARS

- The series of Carnatic Wars started between British and French East India Companies.
- A total of 3 Carnatic Wars were fought between *1744* and *1763*.
- *Dupleix* led the French forces in the first two Carnatic Wars.

1st Carnatic War *(1744-1748)*

- Extension of the Austrian War of Succession.
- *Battle of Adyar (1746)* is also called the Battle of St. Thome.
- It ended with *Treaty of Aix-la-Chapelle*.
- Won by: *French East India Company*.

2nd Carnatic War *(1749-1754)*

- It started with *Battle of Ambur (1749)* was won by the French forces led by Joseph François Dupleix, supporting Chanda Sahib.
- It ended with Treaty of Pondicherry.

Note: *Dupleix* led French forces in the first two wars.

3rd Carnatic War *(1756-1763)*

- *Battle of Wandiwash (1760)* was a part of 3rd Carnatic War.
- This war was an extension of Anglo-French *War of 7 years* which was caused by *Austrian War of Succession*.
- It ended with *Treaty of Paris*.
- British forces led by *Sir Eyre Coote* defeated the French forces led by *Comte de Lally*.
- Result: French were limited to their enclaves (Pondicherry, etc.) and no further expansion was allowed.

IN BENGAL

- *1717-1727: Murshid Quli Khan* served as the *first Nawab of Bengal*.
- In 1717, Mughal Emperor *Farrukhsiyar* issued a *Golden Farman* (Magna Carta of Trade) that allowed the British East India Company to trade freely in *Bengal* for a yearly payment of 3,000 Rupees. The farman also granted the company the right to issue *Dastaks*, or trade permits, to move goods.

> ***Nawabs of Bengal***
> ***Murshid Quli Khan → Shuja-ud-Din Muhammad Khan → Alivardi Khan (died in: 1756) → Siraj-ud-Daulah***

Siraj-ud-Daulah

- He became the *Nawab* at the age of 23 years after the death of *Alivardi Khan* in *1756*.
- He was the *last self-governing* Nawab of Bengal.
- He was not happy with the Trade privileges enjoyed by Britishers in Bengal.
- Siraj-ud-Daulah, captured the *Fort William* after the British refused to stop fortifying it. The *Black Hole Tragedy* was a night of captivity for British soldiers and other prisoners in a small, airless room in Fort William, Calcutta in *1756*. This incident instigated *Robert Clive*, who decided to take revenge, which led to the Battle of Plassey.

> ***Treaty of Alinagar*** *(1757)*
> ***It was signed between Siraj-ud-Daulah and the Britishers which became the cause of Battle of Plassey.***

Battle of Plassey *(1757)*

- It was fought between the East India Company force led by *Robert Clive* and *Siraj-ud-Daulah* (Nawab of Bengal).
- *Mir Jafar*, the military commander of Siraj-ud-Daulah joined hands with the Britishers.
- This battle confirmed the formal beginning of British Empire in India.

Outcomes of Battle of Plassey

- Siraj-Ud-Daulah was killed (forces led by Mir Madan).
- Mir Jafar was made the new puppet Nawab of Bengal.
- *Then Mughal Emperor: Alamgir II.*
- Subsequently, Mir Qasim (son-in-law of Mir Jafar) came to the throne. He shifted the capital from *Murshidabad* to *Munger* (he also ended Dastak issued by Farrukhsiyar).
- Combined forces *Shuja-ud-daulah* (Nawab of Awadh), *Mir Qasim* and *Shah Alam II* (Mughal Emperor) led to *Battle of Buxar (1764)* against the Britishers.

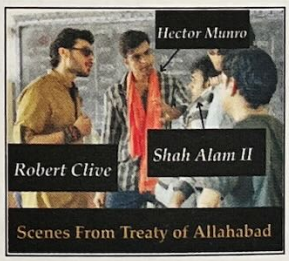
> - ***1st Nawab of Awadh: Saadat Khan Burhan-ul-Mulk.***
> - ***The fourth Nawab of Awadh → Nawab Asaf-ud-Daula, built Bara Imambara in Lucknow.***

Battle of Buxar *(1764)*

- Britishers won this battle led by *Hector Munro*.
- *Treaty of Allahabad* was signed in 1765 between *Shuja-ud-Daula* (Nawab of Awadh), Mughal Emperor *Shah Alam II* and was negotiated by *Robert Clive* on behalf of the East India Company.

Under this, two separate treaty were signed.

First Treaty with Nawab of Awadh:



- *Allahabad* and *Kara* were handed over to Mughal Emperor Shah Alam II.
- Nawab paid Rs 50 lakh to the British as war indemnity.

Second Treaty with Shah Alam II:

- Emperor Shah Alam II was placed under British protection at Allahabad.
- Diwani (revenue rights) of *Bengal, Bihar,* and *Orissa* were given to the East India Company, in return of an annual payment of Rs 26 lakh.
- The Company was to receive Rs 53 lakh from the Emperor for performing nizamat (military and judicial) functions in these provinces. This control over *Diwani* and *Nizamat* Functions by East India Company is called as *Dual Government in Bengal*.
- Mir Jafar was made the Nawab again.
- Allahabad Treaty ran for *7 years* and was ended by *Warren Hastings* in *1772*.

IN MYSORE

• In Mysore, the *Wodeyar Dynasty* was ruling. *Chikka Devaraja Wodeyar* strengthened and consolidated the Mysore state.

• *Hyder Ali* began his career as a soldier under the Wodeyars and gradually rose to power, eventually becoming the de facto ruler of Mysore, while the Wodeyars continued as nominal rulers.

Anglo-Mysore Wars

1st Anglo-Mysore War *(1767-1769)*

• The East India Company, Marathas, and the Nizam of Hyderabad were on one side, while Haider Ali was on the other.

• It ended with the *Treaty of Madras (1769)*, in which the British assured assistance to Haider Ali in the event of an attack by the Marathas or the Nizam.

• Won by: *Mysore*.

2nd Anglo-Mysore War *(1780-1784)*

• Cause: Violation of the Madras Treaty by the British.

• Hyder Ali was defeated in the *battle of Porto Novo (1781)* by the British forces led by Sir Eyre Coote.

• Tipu Sultan sat on throne after the death of his father Hyder Ali due to cancer in the middle of the war.

• There was no winner in this war. It ended with *Treaty of Mangalore*.

3rd Anglo-Mysore War *(1790-1792)*

• The British were led by *Lord Cornwallis*.

• It ended with *Treaty of Seringapatnam*.

• *Tipu Sultan* was defeated in this war (Capital: Seringapatam).

• Under this treaty, a heavy war indemnity of ₹3 crore was imposed on Tipu Sultan.

• Additionally, he had to cede half of his kingdom to the British, Marathas, and the Nizam, and two of his sons were taken as hostages.

4th Anglo-Mysore War *(1798-1799)*

• Tipu established the Jacobin Club and declared himself "Citizen Tipu".

• He planted the *"Tree of Liberty"* in his capital, Seringapatam.

• He established contact with Napoleon Bonaparte and invited him to come to India to launch a joint struggle against the British.

• Due to growing proximity of Tipu Sultan with French, Britishers waged another war with him.

• *Tipu Sultan* was killed in the Battle.

• Result: The independent power of Mysore came to an end.

• The Mysore state was handed back to the Wodeyar dynasty (under British suzerainty).

• British power was fully established in South India.

Subsidiary Alliance

• Subsidiary alliance was introduced by *Lord Wellesley* in *1798*, though it was a brain-child of French Governor General *Dupleix*.

• Under the subsidiary alliance, Indian rulers had to pay subsidy for the British Garrison and British Army deployed in their territory. They had to seek permission from British EIC to partner with any other European for any service, and also for the negotiations with other Indian rulers.

• ***Adopted by:*** Hyderabad (first State to sign in 1798); Mysore (in 1799); Tanjore (in 1799); Awadh (in 1801) and Peshwa (in 1802).

IN PUNJAB

• *Maharaja Ranjit Singh* from *Sukerchakia Misl* (one of the 12 Sikh Misls) signed *Treaty of Amritsar* in *1809* with *British* and declared *Sutlej river* as boundary between the Sikh Kingdom and the British Empire.

• After the death of Maharaja Ranjit Singh (1839), political instability spread in Punjab.

• *Maharaja Duleep Singh* ascended the throne at a very young age.

Anglo-Sikh Wars

1st Anglo-Sikh War *(1845–1846)*

• *Cause:* The British violated the terms of the Treaty of Amritsar (1809).

• *Lord Hardinge* was the Governor-General of India at this time.

Battle of Aliwal (1846)

- It was a part of 1st Anglo-Sikh war
- The British under Sir Harry Smith defeated the Sikh forces

• *Treaty of Lahore (1846)* (Lahore was the capital) and *Treaty of Bhairowal (1846)* were signed between *Maharaja Duleep Singh* and British.

• *Treaty of Amritsar (1846):* In this treaty, the British handed over the Kashmir region to Raja Gulab Singh. In exchange, Raja Gulab Singh paid ₹75 lakh.

• It resulted in the defeat and partial subjugation of the Sikh Empire and cession of Jammu & Kashmir as a separate princely state under British suzerainty.

2nd Anglo-Sikh War *(1848)*

• Mulraj, the Governor of Multan, was dissatisfied with British control.

• In 1848, Mulraj killed two British officers of the East India Company. This incident sparked the Sikh rebellion.

• *Maharaja Duleep Singh* was captured and sent to Britain and *Kohinoor* diamond was stolen. *Lord Dalhousie* was then *Governor-General of India*.

AFGHANS

• **Background:** In the 19th century, the Tsarist Empire (Russia) was expanding rapidly towards Central Asia. The British feared that Russia might attack India, which was the most important colony of the British Empire.

• **Buffer State Policy:** It was considered necessary to make Afghanistan a buffer state to safeguard British India from external threats (especially Russia).

• **Buffer State:** A state located between two powerful countries to prevent direct conflict between them.

• **Ring Fence Policy:** *Warren Hastings* adopted this policy in 1765.

- **Objective:** To create a protective ring of friendly/allied states around Company territories to safeguard them from external threats.

- **Nature:** Defensive policy (focused on protection rather than expansion).

• **Forward Policy:** Associated with *Lord Auckland*.

- It was believed that if Russia advanced towards India, it was better to intervene in Afghanistan beforehand.

- This policy led to British intervention in Afghanistan, resulting in the First Anglo-Afghan War.

Tripartite Treaty (1838):

• The Tripartite Treaty was signed in 1838 under the Forward Policy of Lord Auckland.

• This treaty was between three parties:

1. British Government
2. Shuja Shah Durrani (Afghan Ruler)
3. Ranjit Singh (Sikh Ruler)

Objective:

• To remove Dost Mohammad Khan and install Shuja Shah on the throne of Afghanistan.

• To bring Afghanistan under British influence.

1st Anglo-Afghan War *(1839-1842)*

• Fought during the tenure of *Lord Auckland* (Governor-General of India).

• Initially, the British succeeded in removing *Dost Mohammad Khan* and placed *Shah Shuja Durrani* on the throne of Afghanistan.

• However, this success was short-lived and a rebellion led to the collapse of British control.

• Result: The British were defeated and forced to retreat from Kabul (1842); the retreat was nearly annihilated, marking one of the worst defeats in British Indian history.

• Later, *John Lawrence* (Governor-General) adopted the *Policy of Masterly Inactivity* towards Afghanistan.

2nd Anglo-Afghan War *(1878-1880)*

• *Treaty of Gandamak* was signed between the British Government and Afghan ruler *Yakub Khan*.

• Afghanistan's foreign policy went under British control.

• Some frontier areas were given to British India

• Lord Lytton implemented the "Proud Reserve Policy" of Britain.

• The Durand Line was drawn in 1893 to define the boundary between Afghanistan and British India. This laid the foundation for today's Afghanistan-Pakistan border.

• **Between:** British India and Afghan Ruler *Amir Abdur Rahman Khan*.

• **Drawn by:** *Sir Mortimer Durand*.

3rd Anglo-Afghan War *(1919)*

• Occurred during the viceroyalty of *Lord Chelmsford*; led by *Amanullah Khan*, it ended with the *Treaty of Rawalpindi*, granting Afghanistan control over its foreign affairs.

BURMA (MYANMAR)

1st Anglo Burma War *(1824-1826)*

• It ended with the Treaty of Yandaboo (1826).

2nd Anglo Burma War *(1852-1853)*

OTHER WARS & EVENTS

Battle of Saragarhi (1897):

• The Battle of Saragarhi occurred during a tribal uprising on the North-West Frontier.

• It took place in present-day Khyber Pakhtunkhwa (Pakistan).

• It was associated with the Tirah Campaign (1897-98).

• 21 soldiers of the 36th Sikh Regiment fought against thousands of tribal warriors.

Anglo-Nepal War (1814–1816):

• The *Treaty of Sugauli* was signed after this war in 1816.

• Through this treaty, the border between British India and Nepal was determined, and Nepal had to cede some territories.

REFORM MOVEMENTS IN INDIA

Reformist Movements started in India due to:

1. Social evils in society that existed in forms of untouchability, superstition, polygamy (multiple marriages), purdah system, polytheism (worship of more than one God), etc.

2. Position of women deteriorated in society due to polygamy, Sati system and also because widow remarriage was not allowed.

Steps taken to Ameliorate Women's Position

1. *Abolition of Sati*

- *1829:* An Act passed to abolish *Sati System* with the efforts of *Raja Ram Mohan Roy* (*Lord William Bentinck* was the then *Governor-General of India*).

2. *Widow Remarriage*

- *1856: Widow Remarriage Act* passed with efforts of *Ishwar Chandra Vidyasagar* [Got this title from his college (Principal in Sanskrit College)]
- The Act was drafted during the tenure of Lord Dalhousie and enacted in 1856 under Lord Canning.
- Ishwar Chandra Vidyasagar was against child marriage.

Widow Remarriage Association by:

- *1853: Vishnu Shastri Pandit* formed *Vidhava Vivaha Uttejaka Mandal.*
- *1861: M. G. Ranade* formed a *Widow Remarriage Association.*
- *Satyaprakash* was a *Gujarati* language weekly founded by social reformer and journalist *Karsondas Mulji* with an intention of social reform.

3. *Child Marriage*

- *1891: Age of Consent Act* passed due to the efforts of *B. M. Malabari* (child marriage less than 12 years was not allowed)
- *Sarda Act of 1929:* It is also known as *Child Marriage Restraint Act* through which minimum age for marriage at *14 years* for *girls* and *18 years* for *boys* was set.

4. *Education*

- *1835: Thomas Babington Macaulay* presented *Macaulay's Minute* to promote English education in India.
  - He gave *Downward Filtration Theory.*
  - Only rich Indians were to be given education in English medium.
  - *Lord William Bentinck* (Father of English Education in India) was the Governor-General of India during this time.
- *1854: Wood's Dispatch*
  - It rejected the Downward Filtration Theory.
  - It is also known as *Magna Carta of Indian Education.*
  - According to Wood's Dispatch Primary level education should be given in Vernacular; Secondary level education in Anglo-Vernacular; Higher level education in English.

5. *Certain Women's Organisation Formed*

- ***Bharat Stree Mahamandal (1910)*** → ***Founder: Sarla Devi Chaudhurani.***
- ***Ladies Social Conference (1904)*** → ***Founder: Ramabai Ranade.***
- ***Women's Indian Association (1917)*** → ***Annie Besant, Margaret Cousins*** and ***Jeena Raja Dasa.***
- ***National Council of Women in India (1925)*** → ***Lady Meherbai Tata.***
- ***All India Women's Conference (1927)*** → ***Founder: Margaret Cousins.***
- ***Arya Mahila Samaj (1882)*** → ***Founder: Pandita Ramabai Saraswati.***

> ***1st university for Indian Women (SNDT): by Dr Dhondo Keshav Karve (1916).***

Struggle against Caste based Exploitation (against Chaturvarna System)

- *Bahishkrit Hitakarini Sabha (1924)*: It was established by *B. R. Ambedkar* at *Bombay.*
- *Self Respect Movement (1925)* It was started by *E. V. Ramaswamy Naicker* in *Tamil Nadu.*
  - ***Same movement started by:***
    - Narayan Guru in Kerala.
    - Jyotiba Phule in Maharashtra.
- *Mahad Satyagraha (1927):* It was led by *B. R. Ambedkar* {he also burnt Manusmriti (ancient text upholding caste laws)}.

Raja Ram Mohan Roy and Brahmo Samaj

- He is known as *"Father of Indian Renaissance".*
- He was given the title of *"Raja"* by *Akbar II.*
- *1814:* He established *Atmiya Sabha* in *Calcutta* (Forerunner of Brahmo Samaj).
- *1817:* He founded *Hindu College* in *Calcutta* with the help of *David Hare.*
- *1825:* He established *Vedanta College.*
- *1828*: Raja Ram Mohan Roy founded *Brahmo Sabha,* which later became the *Brahmo Samaj.*
- He also translated *Vedas* in *Bengali.*
- He was against idol worship, polytheism, child marriage.

Writings of Raja Ram Mohan Roy

- ***Gift to Monotheists (Tuhfat-ul-Muwahhidin).***
- ***The Precepts of Jesus.***
- ***Sambad Kaumudi (Bengali).***
- ***Mirat-ul-Akhbar*** (in Persian language).

> ***1791: First Hindu College (Banaras) was founded by Jonathan Duncan.***

Debendranath Tagore

- *1839:* He started *Tattvabodhini Sabha* along with its organ *Tattvabodhini Patrika* in *Bengali* in *Calcutta*.
- *1858:* He invited *Keshab Chandra Sen* to join the *Brahmo Samaj*.
- Due to difference in philosophical thinking, Brahmo Samaj split into two in *1866*, namely *Brahmo Samaj of India* (led by *Keshab Chandra Sen*) and *Adi Brahmo Samaj* (led by *Debendranath Tagore*).
- Later Adi Brahmo Samaj also got divided and Sadharan Brahmo Samaj was founded by Ananda Mohan Bose in 1878.

Veda Samaj

- *1864:* Veda Samaj was formed in *Madras* by *Keshab Chandra Sen* and *K. Sridharalu Naidu*.
- It is also known as *Brahmo Samaj of South India*.

Young Bengal Movement *(Late 1820s and Early 1830s)*

- Started by: *Henry Vivian Derozia*.
- He was a teacher at the Hindu College.

Dharma Sabha → *Revivalist Movement (1830)*

- It was started by *Radhakanta Deb* → He was against the idea of Brahmo Samaj.

Paramhansa Mandali *(1849)* → *(**SSC considers this year as 1840)*

- It was formed by *Dadoba Pandurang* and *Durgaram Mehtaji* in *Maharashtra*.

Prarthana Samaj *(1867)*

- It was formed by *Atmaram Pandurang* in *Maharashtra*.
- *M.G. Ranade* joined it in *1870*, *R G Bhandarkar* was also a member.

Deoband Movement *(1866)*

- Started by: *Muhammad Qasim Nanautavi* and *Rashid Ahmad Gangohi*.
- *Launched in:* Saharanpur district in Uttar Pradesh.

Singh Sabha Movement *(1873)*

- It started in *Amritsar*.
- It aimed to revive Sikh faith by bringing back the converts.

Satyasodhak Samaj *(1873)*

- It was formed by *Jyotiba Phule* (he was from Mali/ Gardener community) in *Maharashtra* against caste discrimination.
- In *1848*, Jyotiba Phule along with his wife *Savitri Phule* (first female teacher of India) started the first school for girls in *Pune*.
- *Books written by Jyotiba Phule: Gulamgiri, Sarvajanik Satyadharma (both in Marathi).*

Arya Samaj *(1875)*

- It was founded by *Swami Dayanand Saraswati* (original name: *Mool Shankar*).
- First unit of Arya Samaj was opened at *Bombay* and later shifted to *Lahore*.
- He advocated for *Caste less* and *Class less society*.
- He gave slogans *"Go Back to Vedas"* and *"India for Indians"*.
- He considered Vedas as infallible but criticised Puranas.
- He believed in Karma and Reincarnation.
- He subscribed (support) the Chaturvarna system on the basis of work not by birth.
- He was against the Idol Worship.
- *Book written by him: Satyarth Prakash*.
- *1886:* Dayanand Anglo-Vedic (DAV) College in Lahore was established in memory of Swami Dayanand by Mahatma Hansraj.
- *1893:* The Arya Samaj members in Punjab were divided on the question of vegetarianism and modem education. The group that refrained from eating meat were called the *"Mahatma"* group and the other group, the *"Cultured Party"*.

Aligarh Movement *(1875)*

- *Started by: Sir Syed Ahmed Khan*.
- He established a *Mohammaden Anglo Oriental College* in *1875* which was later called *Aligarh Muslim University* in *1920*.
- He also founded Indian Patriotic Association in 1888.
- *Magazine: Tahdhib-ul-Akhlaq* (improvement of manners and morals).

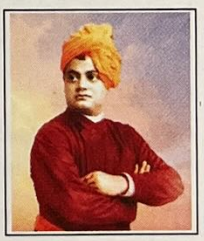
Dev Samaj *(1887)*

- *Founder: Shiv Narayan Agnihotri* at *Lahore*.

Shuddhi Movement

- It was a purification movement initiated by the *Arya Samaj* to reconvert people who had converted to other religions (especially Islam and Christianity) back to Hinduism.

Swami Vivekananda



- He started the *Ramkrishna Movement*.
- *Original Name: Narendranath Dutta*.
- *His birth: 12 Jan 1863* is celebrated as *"National Youth Day"*.
- *Died on: 4 July 1902*.
- He believed in idol worship.
- *Books written: Raja Yoga, Karma Yoga*.
- *1893:* Swami Vivekananda gave a speech in *Chicago (USA)* in a conference.
- He advocated on how to make balance between Materialism and Spiritualism.
- *Swami Vivekananda Rock Memorial* is in *Tamil Nadu* (Kanyakumari).

Ramkrishna Mission/Ramkrishna Movement *(1897)*

- It was started by *Swami Vivekananda* in the memory of his *Guru Ramkrishna Paramhansa* (Priest of Kali Mandir in Calcutta) → *Original name: Gadadhar Chattopadhyay.*
- *HQ: Belur Math; Howrah (West Bengal).*
- According to him *"Service to man is service to God".*

Balshashtri Jambhekar

- *He started two newspapers: Darpan and Digdarshan.*

He is remembered as the *"Father of Marathi Journalism".*

Gopal Hari Deshmukh

- *Pen name: Lokhitwadi.*
- *He started weekly newspapers: Prabhakar and Hitechhu.*

Gopal Ganesh Agarkar

- *He started a weekly: Sudharak.*

Servants of India Society *(1905)*

- *Founder: Gopal Krishna Gokhale.*
- He was political Guru of *Gandhi* and *Jinnah.*
- To promote education and social service in India.

Seva Sadan *(1908)*

- *Founder: B. M. Malabari.*
- He worked against child marriage and for widow remarriage.

Social Service League *(1911)*

- *Founder: Narayana Malhar Joshi* at *Bombay.*
- He also started *All India Trade Union Congress* in *1920.*

Wahabi Movement

Faraizi Movement (1818)
- *Started by: Haji Shariatullah.*

- *Started by: Sayyid Ahmad Barelvi* of Rae Bareli.
- It was a Muslim revivalist movement, popularly known as Tariqa-e-Muhammadiya.
- Syed Ahmad Barelvi and his followers worked to transform India from *Dar-ul-Harb* (land of non-Islamic rule) into *Dar-ul-Islam* (land governed by Islamic principles).

SOCIO RELIGIOUS REFORM MOVEMENTS IN SOUTH INDIA

Satnami Movement

- It started in 1820s in *Chhatisgarh* region by *Guru Ghasidas* who belonged to Satnami sect.
- He worked with the leatherworkers (around 1820) to improve their social status.

Theosophical Society *(1875)*

- It was started in *New York (USA)* by *HP Blavatsky* and *HS Olcott.*
- The society's HQ was shifted to *Adyar Madras* from *New York* in *1882.*
- Later *Annie Besant* took its membership.
- This society was highly influenced by Hindu belief system.

Indian National Social Conference *(1887)*

- *Founders: M. G. Ranade* and *Raghunath Rao.*
- *Pledge Movement* was started by them against child marriage.

Shree Narayana Guru Dharam Paripalana (SNDP) Movement

- *Started by: Shree Narayan Guru Swami* for the upliftment of *Ezhavas Community* of *Kerala.*
- *Important slogan: "Oru Jathi, Oru Matham, Oru Daivam"* (One Caste, One Religion, One God for All).

Justice Movement *(1917)*

- *Started by: C. N. Mudaliar, T. M. Nair and P. Tyagaraja.*

Self Respect Movement *(1925)*

- **Founder:** *E.V. Ramaswamy Naicker* (also known as Periyar) in Tamil Nadu.
- **Objective:** Rejection of Brahminical dominance and rituals.

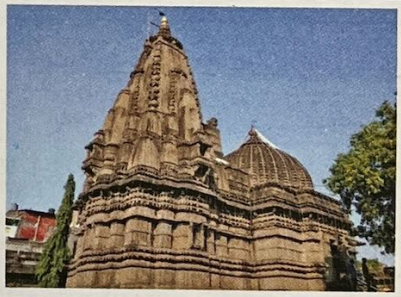
Note : The Civil Disobedience Movement in Kerala was led by K. Kelappan.

Amar Jiban by Rassundari Devi → 1st known autobiography written by an Indian Woman.

Temple Entry Movement *(for the entry of Dalits in temple)*

- Temple entry movement was started by *Dr B.R. Ambedkar* in *1927.*
- In *South India (1924),* it was started by *T. K. Madhavan.*
- *Vaikom Satyagraha (1924),* it was started by *K.P. Kesava Menon.*

Stri Purush Tulna was written by: Tarabai Shinde.



Kalaram Temple, Nashik

- B. R. Ambedkar started Temple Entry Movement in 1930 here for the entry of Dalits in this temple

- *All India Depressed Classes Association (1926): Formed in Nagpur, led by M.C. Rajah.*
- *All India Depressed Classes Congress (1930): Led by Dr. B.R. Ambedkar.*

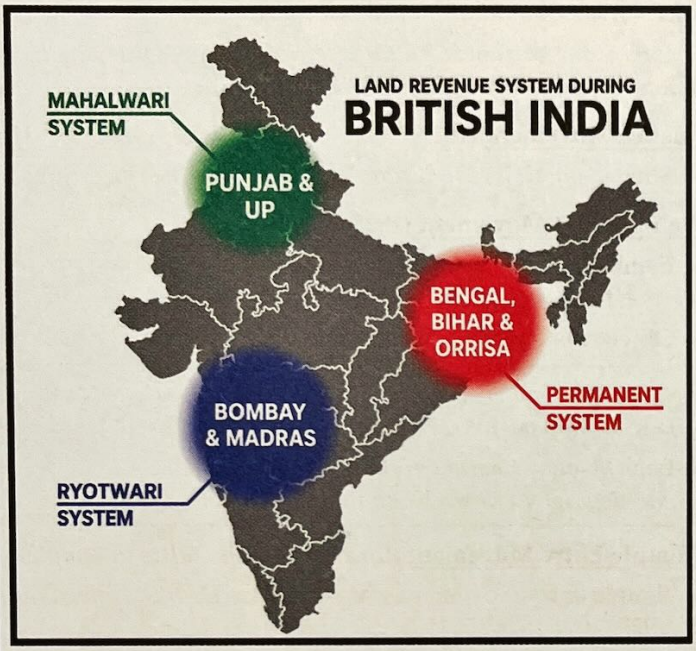
PRE-1857 REVOLTS

Reasons for Land Revolts in India

- Before Independence, there were three major land reforms prevailing in the country:

1. *Permanent Settlement*
2. *Ryotwari System*
3. *Mahalwari System*

Lord Cornwallis introduced Daroga System replacing Zamindari Thanedars.



Permanent Settlement *(1793)*

- ***Introduced by:*** *Lord Cornwallis.*
- Planned by: *John Shore.*
- It is also known as *"Zamindari System"*.
- Under the Zamindari system, the land revenue was collected from the farmers by the intermediaries known as Zamindars (the middle man).
- ***It was introduced in:*** *Bengal, Bihar, Orissa, Uttar Pradesh, and Madhya Pradesh.*

A sunset clause was introduced in the Zamindari system that required zamindars to pay afixed amount of revenue by a specific date, before sunset. If the zamindars failed to pay the revenue on time, the government would confiscate and auction off their zamindari, which was hereditary.

Ryotwari System *(1820)*

- Introduced by: *Thomas Munro* and *Captain Alexander Read.*
- It was based on *Ricardian Theory of Rent.*
- Under the Ryotwari system *(Ryot: Peasant)*, the land revenue was paid by the farmers directly to the state.
- ***It was introduced in:*** *South India* (Madras region of Tamil Nadu).

Mahalwari System *(1822)*

- Introduced by: *Holt Mackenzie* (Concept) and later reformed by *William Bentinck* (1833).
- ***It was introduced in***: North-Western Provinces, Central India, Punjab, and parts of Uttar Pradesh (Gangetic Valley).
- Under the Mahalwari system, the land revenue was collected from the farmers *by the village headmen on behalf of the whole village* (and not the zamindar).
- The village or group of villages was termed a *"Mahal"* and treated as a single revenue unit.

REVOLTS

Tribal Revolts in India during British Rules

Rebellion	Leaders	Year	Region	Key Facts
Paharia Rebellion	Raja Jagannath, Tilka Manjhi	1771-1785	Rajmahal Hills, Jharkhand	1st tribal revolt (British adopted the policy of 'Grant-in-aid' to appease tribal chiefs).
Chuar Rebellion	Durjan Singh, Raja Mohan Singh	1776-1799	Bengal-Bihar border	1799 Suppressed; highlighted discontent among tribal zamindars and against British revenue policies
Tamar Revolt	Bholanath Singh (Sahay)	1782-1832	Tamar (Chottanagpur)	1st armed tribal rebellion against British rule. Bhola Nath Singh was captured by Captain Ben in 1798
Bhil Revolt	Sewaram Kazi Singh (Khajya Naik), Bhima Naik	1818	Khandesh, Maharashtra	
Ho Revolt	Raja Parahat	1820-1821	Singhbhum, Jharkhand	

Rebellion	Leaders	Year	Region	Key Facts
Ramosi Risings	Chittur Singh	1822	Western Ghats (Maharashtra)	Later, Ramosi Kisan sena in Maharashtra was led by Vasudeva Balwant Phadke.
Koli Rising	Ramji Bhangre	1822–1829	Ahmednagar, Maharashtra	
Ahom Revolt	Gomdhar Konwar (an Ahom Prince)	1828	Assam	Treaty of Yandaboo 1826
Kol Uprising	Buddha Bhagat	1831	Chota Nagpur, Jharkhand	Against landlords & British. Suppressed by 1832; under Captain Thomas Wilkinson.
Khasi Revolt	Tirot Singh	1829–1833	Meghalaya	Against the British East India Company's attempt to construct a road through the Khasi Hills, connecting Assam to Sylhet. Ka Phan Nonglait; she is considered the first freedom fighter from khasi hills.
Bhumij Rebellion	Ganga Narayan Singh	1832–33	West bangal,east Jharkhand	role played by Ganga Narayan Singh ; British also called him "Ganga Narayan's Hangama"
Tai-Khamti Rebellion	Chief Chowpha Planglu	1839	Assam	
Khond Uprising	Chakra Bisoi	1837-1856	Odisha	Triggered by British intervention in the Meriah (human sacrifice)
Santhal Hul	Sido, Kanhu, Chand, Bhairav	1855-1856	Santhal Parganas, Jharkhand	led to the creation of the Santhal Parganas; Tenancy Act of 1876
Bhil Revolt	Bhagoji Naik	1857-1858	Khandes, Maharashtra	Linked to 1857 Revolt
Naikda Revolt	Rup Singh Naikda	1858-1868	Panch Mahals, Gujarat	aiming to end foreign rule and establish "Dharma Raj
Kherwar Revolt	Bhagirath Manjhi	1874	Santhal Parganas of Jharkhand.	
Koya Revolt	Tomma Dora	1879-1880	Godavari District, Andhra Pradesh	British deprived the tribals of their traditional rights over the toddy trees (against forest laws).
Birsa Munda Revolt	Birsa Munda	1895-1901	Chota Nagpur, Jharkhand	(Ulgulan)Suppressed; his birth anniversary (November 15) is observed as Janjatiya Gaurav Diwas
Bastar Rebellion	Gunda Dhur	1905-1910	Bastar, Chhattisgarh	Partially successful; forest regulations were relaxed.
Tana Bhagat Movement	Jatra Bhagat	1914-20	Ranchi, Jharkhand	Non-violent movement; gained some concessions from British.
Heraka Movement	Haipou Jadonang	1920	Northeast	Later, Rani Gaidinliu: Jadonang's niece took over leadership, earning the title "Rani" (Queen) from Jawaharlal Nehru.
Rampa Rebellion	Alluri Sitarama Raju	1922-1924	East Godavari, Andhra Pradesh	Suppressed; he was known as "Manyam Veerudu" (Hero of the Jungles); adopted Guerrilla warfare tactics
Gond Revolt	Komaram Bheem	1940	Adilabad Telangana	Bheem coined the iconic slogan "Jal, Jangal,Zameen" (Water, Forest, Land),
Tana Movement	Jatra Oraon	1940-1941	Jharkhand	Non-violent; resulted in relaxed forest laws.

Rebellion	Leaders	Year	Region	Key Facts
Warli Revolt	Godavari Parulekar	1945-47	Maharashtra	Also known as Godutai (elder sister) by the Adivasis

Peasant Revolts in India during British Rule

Rebellion	Leaders	Year	Region	Key Facts
Rangpur Peasant Revolt	Dhiraj Narayan	1783	Bengal	Against the oppressive revenue farming system (Ijaradari system) and its agents.
Paika Rebellion	Bakshi Jagabandhu	1817	Khurda, Odisha	Early revolt against British; inspired future revolts.
Waghera Rising	-	1818-1820	Okha Mandal, Gujarat	
Barasat Uprising	Syed Mir Nisar Ali (Titu Mir)	1831	Barasat, Bengal	Crushed; highlighted Muslim peasant discontent.
Pagal Panthis	Karam Shah, Tipu Shah	1825-1833	Mymensingh, Bengal	Peasant uprising against landlords and British authority.
Indigo Revolt	Digambar, Bishnu Biswas	1859-1860	Bengal	Dinabandhu Mitra, play Nil Darpan ("The Indigo Mirror")
Pabna Agrarian Movement	Ishan Chandra Roy	1873-1885	Bengal	Outcome: Bengal Tenancy Act of 1885
Deccan Riots	Kunbi Peasants	1875	Poona, Maharashtra	Against Gujarati and Marwari moneylenders. Led to the Deccan Agriculturists Relief Act 1879
Champaran Satyagraha	Mahatma Gandhi	1917	Champaran, Bihar	Successful; led to the abolition of the 'Teen Kathia' system.
Kheda Satyagraha	Gujarat, Sardar Patel	1918	Revenue remission	Tax relief
Moplah Rebellion	Ali Musaliar	1921	Malabar, Kerala	Wagon Tragedy; Violently suppressed; both anti-British and communal aspects.
Bardoli Satyagraha	Sardar Vallabhbhai Patel	1928	Bardoli, Gujarat	Successful; tax increase cancelled.
Koraput Uprising	Laxman Naik	1942	Odisha	During Quit India Movement
Tebhaga Movement	Hare Krishna Konar, Bhavani Sen	1946	Bengal	Bengal famine of 1943
Telangana Rebellion	Communist Party of India	1946-1951	Telangana, Hyderabad State	Suppressed; influenced future land reforms.

Other Revolts in India during British Rule

Rebellion	Leaders	Year	Region	Key Facts
Fakir-Sannyasi Rebellion	Majnu Shah, Bhabani Pathak Devi Chaudhurani	1763-1800	Bengal, Bihar	Bankim Chandra Chatterjee's novel Anandamath, mentions this rebellion
Benares Revolt	Raja Chait Singh	1781	Banaras (Varanasi)	
Revolt of Raja of Vizianagaram	Raja Vijaya Rama Gajapathi Raju II	1794	Andhra Pradesh	Battle of Padmanabham (1794)
Polygar Wars (First War)	Kattabomman Nayak	1799	Tamil Nadu	Resistance to British tax collection; suppressed.
Vellore Mutiny	Sons of Tipu Sultan	1806	Vellore, Tamil Nadu	Carried out by Indian sepoys with involvement/support linked to the sons of Tipu Sultan.
Velu Thampi Revolt	Velu Thampi Dalawa	1809	Area: Travancore	He committed suicide in the Mannadi Temple in 1809 to evade capture

Rebellion	Leaders	Year	Region	Key Facts
Bareilly Uprisings	Mufti Muhammad Aiwaz	1816	Bareilly, Uttar pradesh	
Kutch Rebellion	Rao Bharmal II	1816-32	Cutch, Gujrat	
Paika Rebellion	Bakshi Jagabandhu	1817	Khurda, Odisha	
Faraizi Movement	Haji Shariatullah	1818	East Bengal	Religious and economic movement; challenged landlords and British.
Kittur Revolt	Rani Chennamma	1824	Karnataka	EIC refused to recognize the adoption, attempting to annex Kittur, an early instance of what later became the Doctrine of Lapse.
Gadkari Conspiracy	Babaji Ahirekar	1844	Kolhapur, Maharashtra	
Wahabi Movement	Syed Ahmed Barelvi	Early 19th century	NW Frontier, Punjab	Islamic revivalist movement; in India started in the early 1820s in Patna, Bihar,
Kuka Movement	Baba Ram Singh (founded the Namdhari sect)	1872	Punjab	Kuka Movement was founded in 1840 by Bhagat Jawahar Mal

1857 REVOLT

Causes of 1857 Revolt

British Policies

1. General Service Establishment Act (1856)

- Passed by *Lord Canning*.
- It mandated that Bengal Army sepoys must serve overseas if required (crossing the sea was considered a loss of caste).

2. Doctrine of Lapse

- It was introduced by *Lord Dalhousie* in *1848*.
- If an Indian ruler died without a male heir, his kingdom would *"lapse"* and automatically become part of the East India Company's territories.

Acquired places under Doctrine of Lapse:

1. *Satara: 1848*
2. *Sambalpur, Jaitpur: 1849*
3. *Udaipur: 1852*
4. *Jhansi:1853*
5. *Nagpur: 1854*

- *Dalhousie stated that "Awadh is like that cherry that will drop into our mouth one day".*
- *Awadh was captured on the grounds of Misgovernance in 1856.*
- *Mirza Wajid Ali Shah was the last Nawab of Awadh.*
- *Birjis Qadr, the son of the deposed Nawab Wajid Ali Shah, was proclaimed the new Nawab of Lucknow.*
- *"Nursery of the British Army": Awadh was called so because a large number of sepoys in the British Army were recruited from this region; its annexation deeply angered them and contributed to the Revolt of 1857.*
- *The Summary Settlement (1856): Introduced by the British to bypass Taluqdars and deal directly with peasants, which dispossessed traditional landlords and pushed them to join the revolt.*

3. Introduction of "Enfield" rifle

It was said that the cartridge of the rifle was wrapped in the *fat of cow* and *pig*. The cartridge had to be bitten off before loading it into the gun, thus Hindu and Muslim soldiers were reluctant to use it.

- Mangal Pandey was a sepoy in the *34th Bengal Native Infantry* at *Barrackpore* and he refused to use the rifle.
- On *29th March 1857*, he attacked British officers in Barrackpore.
- He was hanged on *8th April 1857*.
- On *9th May 1857*, 85 sepoys in Meerut were dismissed and sentenced to 10 years in jail for refusing to use the Enfield cartridges.
- The Revolt of 1857 began in Meerut on *10th May, 1857* with the march towards Delhi.

- *Ishtahars: They glorified the co-existence of different communities under the Mughal Empire.*
- *Azamgarh Proclamation (1857): A manifesto issued by Feroz Shah (Grandson of the Mughal Emperor) appealing to all sections of society to unite against the British.*

Hotspots and Leaders of 1857 Revolt

- *Delhi: General Bakht Khan and Bahadur Shah II.*
- *Lucknow: Begum Hazrat Mahal.*
- *Kanpur: Nana Saheb* (adopted son of Baji Rao II)/*Tantia Tope*.
- *Bihar: Kunwar Singh (landlord).*
- *Bareilly: Bahadur Khan Rohilla.*
- *Jhansi: Rani Lakshmibai* → Original name: *Manikarnika Tambe* (Manu).

• *Faizabad:* *Maulvi Ahmadullah* (also known as Danka Shah).

• *Uttar Pradesh:* *Shah Mal* → He mobilized and organized the villagers of Pargana Baraut.

Suppressors of Revolt

• *Delhi:* *John Nicholson.*

• *Lucknow:* *Colin Campbell.*

• *Kanpur:* *Colin Campbell.*

• *Jhansi:* *Hugh Rose.*

• *On 20th June 1858 in Gwalior* → The revolt was fully suppressed.

Battle of Chinhat (1857) was fought between the British forces and Indian rebels.

It resulted in the defeat of the British forces led by Henry Lawrence at the hands of Indian rebels led by Maulvi Ahmadullah Shah and Barkat Ahmad.

• Bahadur Shah II was deported by the British to Rangoon in Burma (presently Myanmar).

Reasons for Failure of 1857 Revolt

• Due to limited territorial and social base, the revolt was primarily concentrated in North India.

• Lack of coordination and leadership.

• Lack of political perspective.

Comments

• *V D Savarkar* stated it as *"First war of Independence".*

• *RC Majumdar:* It is neither "First", nor "National" nor a "War of Independence".

Aftermath of Revolt

Government of India Act 1858

• East India Company was abolished.

• *Queen's Proclamation* → *Crown Rule* (transfer of power from East India Company to the British Crown). *Queen Victoria* was the then Queen.

• The British significantly restructured the Indian Army, and the proportion of Indian soldiers was *reduced* (on the recommendation of the *Peel Commission*).

• Governor-General became *Viceroy* → 1st Viceroy: *Lord Canning.*

Some Other Revolts

Indigo Revolt *(1859)*

• It started in *Nadia* (District) of *Bengal.*

• *Leaders:* *Digambar Biswas* and *Bishnucharan Biswas.*

• It was against the exploitative practices of British planters who forced Indian farmers to cultivate *indigo* instead of food crops on their land.

• It was a successful revolt.

• *Dinbandhu Mitra* wrote *"Nil Darpan"* (a play about Indigo Revolt). The play was translated into English by the famous Bengali poet and playwright *Michael Madhusudan Dutt.*

• The Hindoo Patriot, an English weekly started in 1853 at Calcutta by *Girish Chandra Ghosh* and later edited by *Harish Chandra Mukherjee,* exposed the atrocities of British indigo planters and supported peasants during the Indigo Revolt.

Deccan Revolt *(1875)*

• It started in Maharashtra (Deccan region).

• *Cause:* Agrarian riots against moneylenders and debt bonds.

• *Background:* The Cotton Boom

• Before 1861, Britain imported 3/4th of its cotton from America.

• *American Civil War (1861):* Supply from America stopped. Britain turned to India.

• *Cotton Supply Association (1857):* Formed in Britain to encourage Indian farmers to grow cotton for British industries. Farmers took loans to expand cultivation, expecting high profits.

→ However, after the end of the American Civil War, the demand for Indian cotton declined sharply, leading to losses for farmers.

Manchester Cotton Company was formed in 1859

Result:

• *Deccan Riots Commission (1878):* Setup to investigate the causes.

• The Deccan Agriculturists' Relief Act (1879) was passed to protect farmers.

Pabna Revolt *(1873-1876)*

• It started in Bengal.

• *Started by:* *Ishan Chandra Roy* also known as *"Bidrohi Raja"* or *"Rebel King".*

Ramosi Peasant Force *(1879)*

• *Founded by:* *Vasudev Balwant Phadke* in *Maharashtra.*

ASSOCIATION FORMED BEFORE CONGRESS

• Few regional level associations were formed before Congress.

1. Bangabhasha Prakasika Sabha

• *1836:* It was started by associates of *Raja Ram Mohan Roy*.

2. British Indian Association (1851):

• It was founded by *Radhakanta Deb* and *Debendranath Tagore* in *Kolkata*.

3. East India Association

• *1866:* It was founded by *Dadabhai Naoroji* in *London*.

4. Poona Sarvajanik Sabha

• *1870:* It was started by *M G Ranade* (in Maharashtra).

5. Indian League

• *1875:* It was founded by *Sisir Kumar Ghosh* in *Calcutta*.

• He founded Bengali newspaper: *Amrita Bazar Patrika*.

6. Indian National Association

• *1876:* It was founded by *Surendranath Banerjee* and *Anand Mohan Bose*.

• It later merged into the Congress

7. Madras Mahajan Sabha

• *1884:* It was founded by *M. Viraraghavachari, G. Subramanian Iyer and P. Ananda Charlu.*

8. Bombay: Presidency Association

• *1885:* It was founded by *Pherozeshah Mehta, K. T. Telang, and Badruddin Tyabji.*

DADABHAI NAOROJI

- *He was the first Indian British member of Parliament.*
- *He presided three sessions of Congress (1886, 1893, 1906).*
- *He prepared the first estimate of the National Income of India in 1876 (he is also known as "Father of National Income in India").*
- *He used the term "Swaraj" for the first time.*
- *He is also known as "Grand Old Man of India".*
- *Rast Goftar (a weekly newspaper by him for Parsi community) and Voice of India.*
- *Book written: "Poverty and Un-British Rule in India" (explains the Drain of Wealth Theory).*
- *He also started a movement called "Rahnumai Mazdayasnan Sabha" in 1851 along with Naoroji Furdonji and S.S. Bengalee.*

FORMATION OF CONGRESS

• ***Founder:*** It was formed by *Allan Octavian Hume* in *1885* known as *Father of Indian Ornithology*.

• ***1885:*** First meeting was called upon in *Poona* however due to plague the venue was changed to *Bombay*.

• First Session was held at *Gokuldas Tejpal Sanskrit College, Bombay* (*72 delegates attended* this first Session, where only *two Muslim members and no women participated*).

• Immediate cause for the formation of INC was:

Ilbert Bill, 1883

• It was a measure that allowed senior Indian magistrates to preside over cases involving British Subjects in India → But this received a huge backlash from Britishers. Due to which it had to be taken back and this exposed the Real face of Britishers to Indians.

DIFFERENT THEORIES ON CONGRESS FORMATION

• ***Safety Valve Theory:*** *Lala Lajpat Rai* (monthly magazine by him: *Young India*).

• ***Conspiracy Theory:*** *R. P. Dutt*.

• ***Lightning Conductor Theory:*** *Gopal Krishna Gokhale*.

Dufferin was the Viceroy at the time of formation of Congress and called Congress a "Factory of Sedition".

IMPORTANT SESSIONS OF CONGRESS

• **First Session:** 1885 → Headed by W.C. Banerjee in Bombay, where 72 Delegates attended it.

• **Second Session:** 1886 → Headed by Dadabhai Naoroji in Calcutta, where 434 Delegates attended it.

• **Third Session:** 1887 → Headed by Badruddin Tyabji in Madras. He was the *first Muslim President* of Congress.

• **Fourth Session:** 1888 → Headed by George Yule in Allahabad. He was the *first British President* of Congress.

• **1896:** Held in Calcutta. Our National Song, *Vande Mataram* was sung for the first time by *Rabindranath Tagore* (written by: *Bankim Chandra Chatterjee*).

• **1901:** Held in Calcutta. Mahatma Gandhi participated in this INC Session for the first time.

• **1905:** Headed by Gopal Krishna Gokhale in Benaras. *Swadeshi Movement* was formally adopted here.

• **1906:** Headed by Dadabhai Naoroji in Calcutta. Four resolutions: *Swaraj, Swadeshi, Boycott,* and *National Education* were adopted.

• **1907:** Headed by Rash Behari Ghosh in Surat. In this Session the *Congress split into Extremists* and *Moderates*.

- **1911:** Held in Calcutta. Our National Anthem, *Jana Gana Mana* written by *Rabindranath Tagore* was first sung in this Session.
- **1916:** Headed by Ambika Charan Mazumdar in Lucknow leading to merger of Congress. *A Joint Pact* also known as *Lucknow Pact* was signed between the Muslim League and Indian National Congress.
- **1917:** Headed by Annie Besant in Calcutta (*first Women President of Congress*).
- **1924:** Headed by Mahatma Gandhi *(only Session presided by him)* in Belgaum (Karnataka).
- **1925:** Headed by Sarojini Naidu *{first Indian women President of Congress* in Kanpur and also *first woman Governor of an India state (Uttar Pradesh)}*.
- **1929:** Headed by Jawaharlal Nehru in Lahore. The INC passed the resolution for complete independence or *Purna Swaraj* (*January 26, 1930* was officially declared to be celebrated as *first Independence Day*).
- **1931:** Headed by Sardar Patel in Karachi.
- **1937:** Headed by J L Nehru in Faizpur *(first Session to be held in a village)*.

1938-1939: Mahatma Gandhi Vs Subhash Chandra Bose

- In *1938* Session, held at *Haripura (Gujarat)* and S C Bose was *elected* as *President of INC*.
- In *1939* Session, held at *Tripuri* and S C Bose was *re-elected* by defeating Gandhi's candidate Pattabhi Sitaramayya, but later S C Bose resigned.

- ***Rajendra Prasad was elected as President in 1939.***
- ***Madan Mohan Malviya presided INC Session most number of times.***
- ***JB Kriplani: President during the time of Independence.***
- ***Youngest President of INC: Abul Kalam Azad***

Note: It is advisable to read about the Sessions after you have read the entire Modern History.

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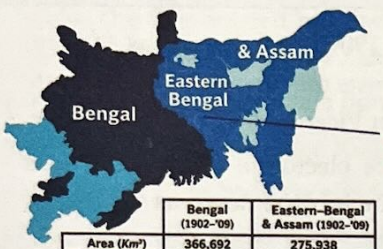
BENGAL PARTITION: 1905

• *Lord Curzon (1899-1905)*, the then Viceroy of India, *proposed the partition* in *1903*.

• The partition created a divide between *Hindus and Muslims*, leading to communal tensions that would echo throughout India's struggle for independence.



Bengal 1905–1911

Bengal constituted 1/4th of the total British India population.

	Bengal (1902–'09)	Eastern–Bengal & Assam (1902–'09)
Area (*Km²*)	366,692	275,938
Population (Mn)	54	31
Muslims (Mn)	9	18
Muslims (%)	16.67	58.06

Revolutionary Policies of Lord Curzon

1. ***Calcutta Corporation Act (1899):*** Reduced the number of elected Indian members in the corporation.

2. ***Official Secrets Act (1904):*** Enacted to curb the freedom of the Press.

3. ***Indian Universities Act (1904):*** Increased government control over universities.

4. ***Bengal Partition, 1905***

Bengal was divided into:

1. East Bengal (Muslim) → ***At present:*** Assam and Bangladesh.

2. West Bengal (Hindu) → ***At present:*** West Bengal, Odisha, and Bihar.

Reasons given by Britishers for Partition of Bengal

• The British justified the partition of Bengal in 1905 primarily on grounds of *administrative convenience* and the need to improve governance in a region with a large and diverse population.

• The actual reason was to *"Weaken the Bengal" (the nerve centre of Nationalist activities)*.

• ***Partition announced on:*** *July, 1905*.

• ***Partition came into Force:*** *16th October 1905.*

• ***Reaction:*** Observed as a *"Day of Mourning"*.

SESSIONS OF CONGRESS

1905 Session of Congress

• The Session happened in Benaras and was presided over by *G. K. Gokhale*.

• It approved *Anti Partition Movement/Swadeshi Movement*.

The formal proclamation of the Swadeshi Movement (foreign made goods and products were to be boycotted) was made on *7th August 1905* in *Calcutta Townhall*.

1906 Calcutta Session of Congress

• It was presided over by *Dadabhai Naoroji*.

Four Important Resolutions were Taken in this Session:

• ***Swaraj as a goal adopted.***

• ***Boycott of foreign goods.***

• ***Swadeshi.***

• ***National Education (formation of National Education Council).***

1907 Surat Session of Congress

• It was presided by *Rash Behari Ghosh*.

• In this Session, the Congress split into Moderates and Extremists.

Reasons for their Separation

• The *role of the INC in the manner of opposing the Partition of Bengal* was the main cause of the Split.

• The Extremists wanted the agitation to be a mass struggle all over the country. But the Moderates still had faith in the British administration and wanted to confine the boycott to Bengal and foreign goods only.

• Britishers adopted *"Carrot and Stick Model"* within Congress.

Carrot: Appeasement to Moderates; *Stick:* Suppressing Extremists.

MODERATES AND EXTREMIST

• Methods adopted by Moderates were: Petitions, newspapers, pamphlets.

Moderates

• ***SN Banerjee, KK Mitra, GK Gokhale, Pherozshah Mehta, etc.***

Extremists

• ***Lala Lajpat Rai, Bal Gangadhar Tilak, Bipin Chandra Pal, Aurobindo Ghosh.***

Bande Matram journal was written by: *Bipin Chandra Pal.*

Methods Adopted by Extremists

According to Extremists:

• They had hatred for foreign rule; since no hope could be derived from it.

• *Swaraj to be the goal* of national movement.

• Direct political action was required.

• Belief in capacity of masses to challenge the authority.

• Personal sacrifices required and a true nationalist to be always ready for it.

- *Formation of Swadesh Bandabh Samiti by Ashwini Kumar Dutta at Barisal (in Bangladesh now).*
- *National Educational Centres to be formed.*
- *Indigenous Enterprise: Swadeshi Steam Navigation Company by V.O. Chidambaram Pillai in Tamil Nadu.*

Bal Gangadhar Tilak

B.G. Tilak

- He organised Ganpati, Shivaji festivals to attract and mobilise the youth (in Maharashtra).
- He was titled as *"Father of Indian Unrest"* By *Valentine Chirol* in his book *"India Unrest"*.
- He is famously known as *"Lokmanya Tilak"*.
- *Newspapers Published:*
  - *Mahratta (in English)*
  - *Kesari (in Marathi)*

Newspapers during Anti-partition Movements

- *Hitabadi by: Dwijendranath Tagore.*
- *Sanjibani by: Krishna Kumar Mitra.*
- *Bengalee by: Surendranath Banerjee.*
- *B.G. Tilak said that: Freedom is my Birth Right and I Shall have it.*
- He was sent to *Mandalay Jail* (Burma) from *1908 to 1914*.
- During his imprisonment in Mandalay Jail, he wrote the famous work *Gita Rahasya*.

Abanindranath Tagore

- He painted the image of *Bharat Mata* in *1905*. The painting was a symbol of nationalism during the Indian independence movement.
- He was the principal artist of *Indian School of Oriental Art (1907)*.

Actions to Show Unity

- People tied Rakhi to each other to show unity.
- *Rabindranath Tagore wrote a song: Amar Sonar Bangla* (now it is National Anthem of *Bangladesh*).
- *Sudesa Geethangal*, a collection of poems was written by *Subramaniya Bharti*.
- People sang *Vande Matram* (National Song); however Government banned it.

The painting of Bharat Mata

Leaders

- *Poona and Bombay: Bal Gangadhar Tilak*
- *Delhi: Sayed Haider Raza*
- *Madras: Chidambaram Pillai*
- *Punjab: Lala Lajpat Rai*

Response of Muslims

- Muslims did not support Anti-Partition Movement.
- Formation of *All-India Muslim League* on *30th Dec 1906* in *Dhaka* (now Bangladesh) by *Nawab Khwaja Salimullah* and *Aga Khan*.

INDIAN COUNCIL ACT, 1909

- The Indian Council Act of 1909 is also known as *Morley-Minto Reform. Lord Morley was the then Secretary of State and Lord Minto was the then Viceroy of India.*
- The provision for separate electorate for Muslim was introduced by *Lord Minto* (he is also known as *"Father of Communal Electorate"*).
- Viceroy Executive Council will have one Indian → *First Indian* to be a part of it was *Satyendra Prasad Sinha*.

Annulment of Partition

- In *1911, Lord Hardinge II* organised *Delhi Durbar (3rd Delhi Durbar)* for the coronation of *King George V.*

Key decisions:

1. Reunification of Bengal, announced by *King George V.*
2. The capital was shifted from *Calcutta to Delhi in 1911.*

Note:

→ Delhi Durbans have been organised three times :

- 1st Delhi Durbar (1877): Held under *Lord Lytton* to proclaim Queen Victoria as Empress of India.
- 2nd Delhi Durbar (1903): Held under *Lord Curzon* to celebrate the coronation of Edward VII.
- 3rd Delhi Durbar (1911): Held under *Lord Hardinge II*; during this, the Partition of Bengal was annulled and the capital was shifted from Calcutta to Delhi.

REVOLUTIONARY ACTIVITIES

- **1890:** Shivaji and Ganpati festivals organised by *Bal Gangadhar Tilak.*
- **1897:** Chapekar Brothers (Vasudeo, Damodar and Balkrishna) *assassinated W.C. Rand (Plague Commissioner of Poona).*
- **1899:** Mitra Mela was founded by Savarkar Brothers in Poona.
- **1902:** Anushilan Samiti (Bengal) Founded by *Satish Chandra Basu, Jatindranath Banerjee* and *Pramathanath Mitra*; later *Barindra Kumar Ghosh* formed the Jugantar Group (1906). And Bihar branch (Patna) established by *Sachindra Nath Sanyal.*
- **1904:** Mitra Mela was merged with Abhinav Bharat Society by V. D. Savarkar.

- **1905:** Indian Home Rule and Indian House was formed by Shyamji Krishna Verma in London.
  - *Journal written:* *The Indian Sociologist*
- **1907:** Madam Bhikaji Cama became the *first Indian to hoist Indian Flag on foreign soil (in Stuttgart, Germany).* She published *journal Vande Mataram.*
  - The flag hoisted by Madam Bhikaji was smuggled into British India by *Indulal Yagnik.*
- **1908:** (Alipore/Manicktala Bomb Conspiracy):
- Attempt to murder *Judge Kingsford* in Muzaffarpur.
- *Khudiram Bose* and *Prafulla Chaki* were involved in this.
- The bomb accidentally killed two innocent women (Mrs. Kennedy and her daughter) instead of Kingsford.
- **Result:** Prafulla Chaki shot himself to avoid arrest after the Muzaffarpur incident (1908); Khudiram Bose was hanged in *Muzaffarpur jail.*
- *Kanailal Dutta* killed the witness *Narendranath Goswami.*
- **1909:** Madan Lal Dhingra killed Curzon Wyllie.
- **1909:** AMT Jackson was killed by Anant Lakshman.
- **1910:** Swadesh Sevak Home (Vancouver), United India House (in USA) was founded by *Taraknath Das* and *G.D. Kumar.*
- **1913:** Ghadar Party was formed in San Francisco (*HQ: USA*) by:
  - ***Lala Hardayal, Sohan Singh Bhakna (First President of Ghadar Party), Barkatullah, Parmanand, Kartar Singh***

Note: *Ram Nath Puri* succeeded *Lala Hardayal* (Founder/First Secretary) as the Secretary of the Ghadar Party.

- **1915:** Berlin Committee was formed by Virendranath Chattopadhyay.

> ***In 1911, V.D. Savarkar was sent to Cellular Jail in Andaman & Nicobar Islands.***

Komagata Maru Incident, 1914

- A *Japanese ship* taken on lease by Sikh businessman and sailed to Vancouver (Canada) from *Hong Kong.*
- This incident involved a ship carrying *376 Indian passengers, primarily Sikhs* who were denied entry to Canada due to discriminatory immigration laws. Forced to return to India, they faced further mistreatment, highlighting the struggle against racial discrimination and colonial oppression.

Defence of India Act 1915

- This Act was enacted by the British government in India to *suppress the Ghadrites particularly in Punjab,* during World War I.
- This Act was later replaced by a *Permanent Act called Rowlatt Act.*

World War I

- In *1914, World War I began* → It was fought between the *Central Powers and the Allied Powers.*

Allies of World War I (they won the war)

- ***Belgium, France, Great Britain (and Commonwealth), Italy, Japan, Russia, and USA.***

The Central Power

- ***Austria-Hungary, Bulgaria, Germany, and Ottoman Empire (Turkey).***

During the World War I, in the context of the Indian nationalist:

- The Moderates supported the war as a *matter of duty.*
- The Extremists supported the war, hoping for future *self governance* in return.
- While the Revolutionaries, saw the war as an *opportunity to actively fight against* British rule and seek immediate Independence through forceful means.

HOME RULE LEAGUE (HRL), 1916

- ***Two Home Rule Leagues were formed by:*** Bal Gangadhar Tilak and Annie Besant, both in ***1916.***
- After B G Tilak's death in *1920,* his Home Rule League was renamed as *Swarajya Sabha by Mahatma Gandhi.*

Bal Gangadhar Tilak's HRL	Annie Besant's HRL
• *HQ*: Poona	• *HQ:* Madras
• It was founded first.	• It had more branches of HRL.
• *Centre:* Maharashtra *(excluding Bombay City)*, Karnataka, Central Province, Berar	• *Centre:* Madras and Bombay City

LUCKNOW SESSION, 1916

- This session was presided over by ***Ambika Charan Mazumdar.***
- ***In this session:***
  1. Reunion of Extremists and Moderates.
  2. *Lucknow Pact* (a Joint Pact) was signed between *INC* and *Muslim League.*

Demands of INC

- Self Government.
- Abolition of Indian Council.
- Separation of Judiciary & Executive.

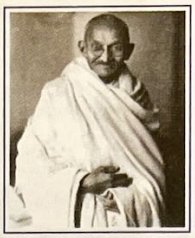
- Salary of Secretary of State from British Exchequer.
- 1/2 members of the Executive Council to be Indians.
- 1/3rd representation to Muslims.

Writings

- *New India and Common Weal by: Annie Besant.*
- *Al Hilal (a weekly Urdu-language newspaper) by: Maulana Abul Kalam Azad (he also wrote a book: India Wins Freedom).*
- *Comrade (a weekly English-language newspaper): Maulana Md. Ali.*

- *In 1906, Sri Aurobindo resigned from his post in Baroda and moved to Calcutta, where he emerged as a leader of the nationalist movement.*
- *He later withdrew from active politics and moved to Pondicherry in 1910, where he devoted himself to spiritual pursuits, establishing the Sri Aurobindo Ashram in 1926 and becoming a renowned philosopher and yogi.*
- *"New Lamps for Old" by Shri Aurobindo Ghose, published in 1893.*

MAHATMA GANDHI



- ***Full name:*** Mohan Das Karamchand Gandhi.
- ***Birth:*** 2nd October 1869 in Porbandar, Gujarat.
- ***Mother:*** Putlibai Gandhi.
- ***Father:*** Karamchand Gandhi.
- ***Wife:*** Kasturba Gandhi.

Education:

- He went to England (London) in 1888 to study Law.
- He returned to India as a Barrister in 1891.
- He started his legal practice in Bombay but was not very successful initially.

Gandhi's Work in South Africa (1893 - 1915)

- Gandhi went to South Africa in 1893 to handle a legal case for Dada Abdulla.
- While traveling from Durban to Pretoria, he was thrown out of a train at Pietermaritzburg station despite holding a valid first-class ticket, due to racial discrimination.
- *Natal Indian Congress (1894):* Established in Durban to fight against racial discrimination faced by Indians and South Africans.
- Transvaal British Indian Association (1903): Established in Johannesburg to voice the grievances of Indians in the Transvaal region.
- *Indian Opinion (1903):* A newspaper started by Gandhi to spread awareness and mobilize public opinion.
- *Phoenix Settlement (1904):* Established near Durban, influenced by John Ruskin's book "Unto This Last".
- *Tolstoy Farm (1910):* Established near Johannesburg, influenced by Leo Tolstoy.
- In 1906, at Johannesburg, Mahatma Gandhi launched his first Satyagraha against the *Asiatic Registration Act* (Black Act), which required Indians to carry fingerprint passes; he also opposed the non-recognition of Hindu marriages by the government.
- Ambulance Corps: During the Boer War, Mahatma Gandhi organized an Indian Ambulance Corps (~1100 volunteers) to assist the British; he was later awarded the *Kaisar-i-Hind Medal* (1915) for his public service.

Gandhi in India

- Gandhi returned to India on *9 Jan 1915* which is celebrated as *Pravasiya Bhartiya Diwas* for *Non-Resident Indians (NRI)*.
- Ashrams: Founded *Kochrab Ashram* (1915) and later *Sabarmati Ashram* (1917).
- *Navjivan* (newspaper in Gujarati) : Founded by *Mahatma Gandhi* in 1919.
- ***Political Guru:*** Gopal Krishna Gokhale.
- His first public appearance was at *Banaras Hindu University (BHU)* inauguration in *1916*.

> *BHU was founded by Madan Mohan Malaviya. He also founded Hindu Mahasabha (1915).*

- ***Book written by Gandhi:*** *Hind Swaraj* (also known as Indian Home Rule, where he wrote that "the British rule in India was a result of cooperation extended by Indians")

> *Autobiography of Mahatma Gandhi: The Story of My Experiments with Truth*

Movements Led by Gandhi ji

1. *Champaran Satyagrah (1917) → First Civil Disobedience Movement*

- *Raj Kumar Shukla* invited Gandhi to *Champaran, Bihar* to complain about injustice of the landlord system where the *farmers were forced to cultivate Indigo in 3/20th part of their land, also known as Tinkathia System.*
- ***Other people involved in Champaran Satyagraha:*** *Rajendra Prasad, Mazhar-ul-Haq, J. B. Kriplani.*

Champaran Agrarian Act *(1918)*

- This act was a direct result of Champaran Satyagraha. It abolished Tinkathia system and suspended *Abwab tax (an illegal collection imposed by landlords on peasants).*

2. *Ahmedabad Mill Strike (1918) → First Hunger Strike*

- *Anusuya Sarabhai* invited Gandhi to *Ahmedabad* where textile workers of mill in Ahmedabad fought for economic injustice when the mill owners discontinued their *Plague Bonus.*
- Workers *demanded a 50% wage hike* to compensate for rising costs of living. *The mill owners offered only a 20% raise* which led to the strike. Finally wage hike was settled at 35%.

3. *Kheda Satyagrah (1918) → First Non-Cooperation*

- This Satyagraha movement was carried out at *Kheda district of Gujarat* in support of the peasants who were not able to pay the land tax due to the failure of crops.
- **Result:** Taxes for the current and next year were waived, confiscated properties were returned to farmers, and the increased revenue rate was reduced.

GOVERNMENT OF INDIA ACT (1919)

- It is also known as *Montagu-Chelmsford Reforms*.
- *Montagu was the Secretary and Chelmsford was the Viceroy.*

Provisions made:

1. It extended *separate electorate* to Anglo Indians, Christians.
2. It introduced *dyarchy at provinces* → Provincial subjects were divided into two parts.

Reserved	*Transferred*
It was administrated by the Governor through his Executive Council.	It was administrated by Ministers from Legislative Council.
Eg: Land revenue, Police, Finance	*Eg: Agriculture, Health, Education*

3. It introduced *Bicameral Legislature at Centre*.

ROWLATT SATYAGRAHA (1919)

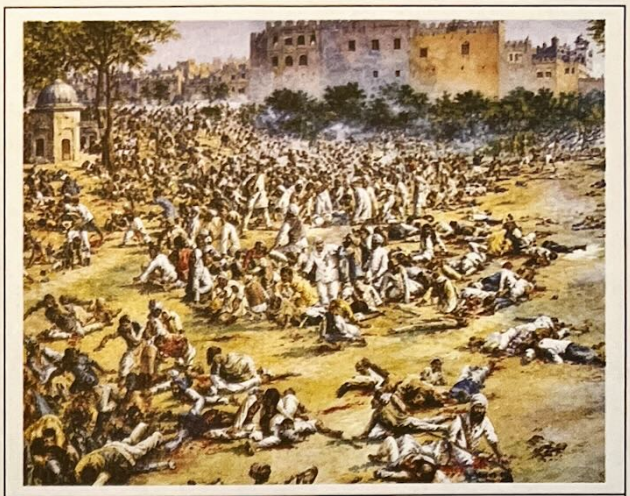
- The Rowlatt Satyagraha was a non-violent protest movement *led by Mahatma Gandhi against the Rowlatt Act (1919)*, which was passed by the British government to curb revolutionary activities in India. He called this Act the *"Black Act"*, the act sought to suspend the law of *Habeas Corpus*, which protects a person's right against unlawful detention.

Background of Rowlatt Act

- It was suggested by *Sydney Rowlatt (a British Judge)*.
- It was officially called the *Anarchical and Revolutionary Crimes Act, 1919*.
- It allowed the British government to *detain people without trial and imprison them for 2 years without trial*.
- It was an extension of the *Defence of India Act, 1915*, a World War I time law, even though the World War I had already ended.

Jallianwala Bagh Massacre, 1919

- It took place on *13 April 1919 (on Baisakhi)*.
- In *Jallianwala Bagh, Amritsar* people gathered in mass for two reasons: *To celebrate Baisakhi* and *to protest against the arrest of Saifuddin Kitchlew* and *Dr. Satyapal*.
- Without warning, Brigadier General Reginald Dyer, accompanied by his armed troops, closed the only exit gate and open fired at the crowd.
- Official records stated 379 deaths, but actual numbers were over 1000.



Jallianwala Bagh Massacre

Aftermath of Jallianwala Bagh Massacre

- *Rabindranath Tagore* returned his *"Knighthood"*.
- Mahatma Gandhi returned his title of *"Kaisar-i-Hind"* that he received for his work during Boer Wars in South Africa.

Hunter Commission (1919):

- It was set up to investigate the actions of Brigadier General Reginald Dyer.
- **Members:** The commission included Britishers and 3 Indian members:
  1. *Harilal Setalvad*.
  2. *Pt. Jagat Narayan*.
  3. *Sardar Sahibjada Sultan Ahmad*.
- **Outcome:** The commission did not impose any penal action on Dyer. The British Parliament passed the Indemnity Act to protect him.

- The British Elites started *"Morning Post"* (a fund collection) in support of Dyer. (*Rudyard Kipling* also funded in this).
- *Arur Singh* (clergy in Golden Temple) titled Reginald Dyer as "Sikh" due to which *Gurudwara Reform Movement* was launched later in *1920* to free the Gurudwaras from corrupt Mahants.
- *Udham Singh* killed *Michael O'Dyer* (Lieutenant Governor of Punjab during Jallianwala Bagh Massacre who supported "Reginald Dyer") using name *"Ram Mohammed Singh Azad"* in 1940.
- *Udham Singh* was hanged in 1940 in Britain.

KHILAFAT MOVEMENT (1919)

- It was launched after World War I.
- When World War I ended, Britishers removed Khalifa in Turkey from power. This instigated Muslims all over the world, and Khilafat movement was its response in India.
- An *All India Khilafat Committee* was setup in *Bombay* on *March 1919*, under the leadership of *Ali Brothers*

(Maulana Ali and Shaukat Ali), Maulana Abul Kalam Azad, Hasrat Mohani, Ajmal Khan.

• All India Khilafat Conference was held in *Delhi on Nov 1919* that was headed by *Mahatma Gandhi (the first President of the Conference)* → This Conference was opposed by Congress and B G Tilak.

Indian National Liberation Federation formed by:
Surendranath Banerjee

NON-COOPERATION MOVEMENT (1920)

• It was launched in *1920.*

• Non Cooperation Movement was approved in a special session of Congress held at Calcutta in 1920 and later endorsed in Nagpur in the annual session. It also led to the formation of *15-membered* Congress Working Committee. Congress committed itself to extra constitution mass struggle from now onwards. *Jinnah, Annie Besant, B C Pal* left the Congress due to ideological differences.

• Gandhi merged Khilafat Movement with it to ensure Hindu-Muslim unity.

• *1921 : Tilak Swaraj Fund* in remembrance of B G Tilak (Died on 1st August 1920). → Target: Rs 1 Crore.

• *Eka Movement (1921):* In Uttar Pradesh, led by *Madari Pasi.*

• *Mappila/Malabar/Moplah Revolt (1921):* The Uprising was mainly led by Muslim peasants against Hindu feudal lords in the Malabar region of Kerala.

• Sikh agitation for removal of corrupt Mahants.

• *Awadh Kisan Movement:* A peasant movement also started to oppose British rule. Awadh Kisan Sabha was organised by *Baba Ramchandra* in *1920.*

Steps Taken to Support the Merger of Khilafat Movement and Non-Cooperation Movement

• On National-level, educational institutions were established as part of boycott of British-run schools and colleges, institutions such as *Jamia Millia Islam, Kashi Vidhyapith, Bihar Vidhyapith.*

• *Fundraising for the Movement*: A significant amount of Rs. 1 Crore was raised, which was utilised to:

→ Promote national education.

→ Organise protest and strikes.

→ Support the boycott movement.

Chauri Chaura Incident (1922)

• On *4th Feb 1922,* the crowd of non-cooperation movement burnt a police station in Chauri Chaura a village in Gorakhpur, in which 22 policemen died.

• As a result, Gandhi called off the non-cooperation movement *due to violence* and was later jailed in *March 1922.*

Suspension of the Movement and Political Vaccum

• In Bardoli, Congress working committee suspended the non-cooperation movement due to violence and focused on constructive work from now onwards.

• This led to a political vacuum within the Congress party, as leaders were divided on what to do next.

The division created two groups:

• *No Changers:* This group, led by *Rajendra Prasad, Vallabhbhai Patel, and M.A. Ansari,* believed in continuing Gandhi's principles. They *boycotted the British councils and instead focused on constructive work like setting up ashrams, schools, and promoting Khadi* (hand-spun cloth).

• *Pro Changers:* It was led by *C.R. Das, Motilal Nehru, and Ajmal Khan,* this group argued that entering the legislative councils would allow them to challenge British rule from within by opposing unfair laws and policies. However, Gandhi initially opposed this idea, as he felt cooperating with the British in any form would weaken the freedom struggle.

FORMATION OF SWARAJ PARTY, 1923

• In the *Gaya Session of Congress (Dec 1922),* the Pro Changers decided to form their own political party the *'Congress Khilafat Swaraj Party'* or *'Swaraj Party'.*

• *Leadership: C.R. Das* → President; *Motilal Nehru* → Secretary.

• *Goal: "To end or mend the Council".*

• Achievement: Successfully defeated the *"Public Safety Bill"* in *1928.*

• *Chittaranjan Das (C. R. Das) is also known by the name of "Deshbandhu".*
• *C.R. Das died in 1925.*

Belgaum Session of Congress, 1924

• It was presided by *Gandhi (it is the only session presided by him).*

• This session *accepted the Swaraj party* within the Congress.

■■■

Socialism

- Theory of Socialism was given by *Karl Marx*, he stated that *"Only option to remove the rich classes from society is mass struggle"*.
- *Reason for Socialism:* Russian Revolution in 1917.
- Das Kapital was written by : *Karl Marx*.

> - *In 1920, All India Trade Union Congress was formed by Lala Lajpat Rai, Joseph Baptista, N. M.Joshi.*
> - *N M lokhande is known as the "Father of Trade Union Movement". He founded Bombay Mill Association.*

Spread of Socialism and Communalism

- *Communist Party of India (CPI)* was formed by *M.N. Roy in Tashkent, Uzbekistan in 1920.*
- In *1924*, the party was involved in *Kanpur Bolshevik Conspiracy Case* → ***People involved: S A Dange, Muzaffar Ahmed, Shaukat Usmani, etc.***
- In *1925*, CPI was formalised in *Kanpur*.
- In *1929*, *Meerut Conspiracy Case* occurred.

Novels and Books

- ***Bandi Jeevan by: Sachin Sanyal.***
- ***Pather Dabi by: Sharat Chandra Chattopadhyay.***
- ***Philosophy of Bomb : Bhagwati Charan Vohra***

EVENTS AROUND INDIA

In Punjab-UP-Bihar

- In *1924*, *Hindustan Republican Association* was formed in Kanpur by *Ram Prasad Bismil, J. C. Chatterjee, Sachin Sanyal.*
- In *1925*, *Kakori Incident/Kakori Train Robbery* took place in Kakori, a village near *Lucknow*.
- Participants who were hanged to death: *Ashfaqullah Khan, Roshan Singh, Ram Prasad Bismil, and Rajendra Lahiri.*

- In *1926*, *Punjab Naujawan Bharat Sabha* was formed by *Bhagat Singh*.
- Bhagat Singh fully accepted Marxism.
- Hindustan Republican Association (HRA) which was later transformed to *Hindustan Socialist Republican Association (HSRA)* in *1928* at *Feroz Shah Kotla by Chandra Shekhar Azad, Bhagat Singh, Sukhdev.*
- In *1928*, *Lala Lajpat Rai* protested against Simon Commission and recited slogan *"Simon go back"*. He was hit by Scott during lathi charge due to which he died afterwards.
- In *1928*, *Bhagat Singh, Sukhdev, Raj Guru killed Saunders instead of Scott* mistakenly in Lahore to avenge the death of Lala Lajpat Rai.

- On *April 8, 1929, Bhagat Singh and Batukeshwer Dutt* bombed Central Legislative Assembly.
  - ***Reason:*** To protest against *"Public Safety Bill" (1928)* as it was Anti-National (as said by Swaraj Party) and *Trade Disputes Bill (1929).*
  - ***Purpose:*** No to kill anyone but *To Make Deaf Hear.*
  - ***Outcome:*** They did not run away; they surrendered to use the court as a platform to spread their ideology.
- In *1929*, *Chandra Shekar Azad* was involved in the conspiracy to *blow up Lord Irwin's train*, unfortunately the plan failed.

Hunger Strike (1929–30):

- Issue: *Bhagat Singh* and other revolutionaries demanded the status of political prisoners (better food, books, no discrimination), which was denied.
- *1st Hunger Strike (June 1929): Jatindra Nath Das* died on *13 September 1929 after a 63-day* fast. The British conceded some demands but later failed to fully implement them.
- *2nd Hunger Strike (1930):* Launched due to the British reneging on earlier assurances.

Lahore Conspiracy Case Trial:

- *A special ordinance (1930)* was issued by the Viceroy to conduct the trial without normal procedures, allowing it to proceed even in the absence of the accused (due to boycott).
- Approvers (Government Witnesses): *Hans Raj Vohra, Jai Gopal, Phanindranath Ghosh, Sobha Singh.*
- *Bhagat Singh, Sukhdev Thapar* and *Shivaram Rajguru*, were hanged by British authorities on March 23, 1931, in Lahore Jail, a day ahead of schedule. Convicted in the Lahore Conspiracy Case for killing British police officer *J.P. Saunders.*
- 23rd March 1931 is celebrated as *"Shaheed Diwas"*.

Slogans of Bhagat Singh

- *"Inquilab Zindabad"* (Long Live Revolution).

(Note: Coined by Hasrat Mohani in 1921, popularized by Bhagat Singh).

- *"Down with Imperialism"*

Note: *30 Jan, the day Gandhiji died is also celebrated as "Shaheed Diwas".*

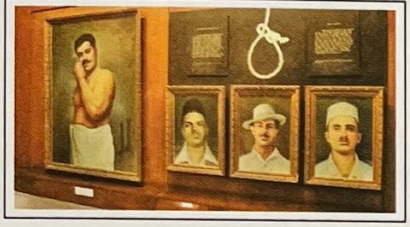
→ Book written by Bhagat Singh: "Why I am an Atheist"

• In 2021, the Uttar Pradesh government renamed the "Kakori Train Robbery" as the "Kakori Train Action."

• The word "Socialist" was added to the Hindustan Republican Association (HRA), which then became the Hindustan Socialist Republican Association (HSRA), reflecting the goal of establishing a socialist state.

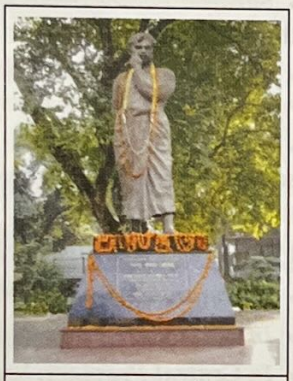
• Lala Lajpat Rai said: "Every blow aimed at me is a nail in the coffin of British imperialism."

• Durgawati Devi (Durga Bhabhi) was a prominent member of the HSRA and actively participated in the revolutionary movement against British rule.



In Bengal

- In *1930, Chittagong Armoury Raid* was led by *Surya Sen* (also known as Master Da).
- Surya Sen was arrested in 1933 and hanged in Jan 1934.
- Women participants involved were: *Pritilata Waddedar, Kalpana Dutta, Suniti Choudhury, Bina Das* and *Shanti Ghosh.*



Statue of Chandrashekhar Azad at Alfred Park

- It is now as Chdrashekhar Azad Park where he shot himself on 27 February 1931 in Allahabad

SIMON COMMISSION

- *Government of India Act 1919* was set to be reviewed by a Commission in *10 years but it announced the appointment of a Commission in just 8 years after the Act* under the chairmanship of *John Simon.*

***Note:** *Clement Attlee (Who later became PM of Britain) was the member of Simon Commission.*

- In *1928*, this *Commission arrived in India* which was a *7-membered Commission (all white and no Indians)* → Revolt against it was set in motion with slogans *"Simon Go Back"* (term coined by *"Yusuf Meherally"*).

Recommendations of Simon Commission

- Abolition of dyarchy.
- Federal system of government should be introduced in India.
- Extended voting rights.
- Separate Muslim electorate.
- It rejected the separation of Sindh from Bombay.
- The demand of frontier for equal status was also neglected.
- It rejected 1/3rd Muslim seats in Central Assembly.

Madras Session of Congress of 1928

- *President: M. A. Ansari.*
- It was a special Session which passed a resolution, calling for boycott of Simon Commission.

Response to Simon Commission

- The then Secretary, Birkenhead challenged the Indian leaders to draft their own Constitution.
- *Congress* set up a committee under the chairmanship of *Motilal Nehru* which presented *Nehru Report.*

Demands in Nehru Report

1. Rejected Separate Electorate.
2. Demand for Dominion status.
3. Linguistic provinces, 19 Fundamental Rights, and a Responsible Government.

- *Delhi Proposals* were given by *Muslim League (1927).*
- *Jinnah* presented his *14 points (1929).* Ignore Jinnah's points in the same manner she ignores you 😉.

- *S C Bose, J L Nehru and Srinivasa Iyengar* formed *Indian Independence League in 1928. The league was formed in opposition to the Nehru Report.*
- *Those in support of Simon Commission: BR Ambedkar and Hindu Mahasabha (founded in 1915 by Madan Mohan Malaviya). Hindu Mahasabha initially supported the commission but later boycotted it.*

- *Muddiman Committee (1924):* Examined the working of Diarchy under the Government of India Act, 1919.
- *Linlithgow Commission (1926):* Also known as the Royal Commission on Agriculture, focused on agricultural conditions in India.
- *Lee Commission (1924):* Examined the recruitment and Indianization of Civil Services.

Bardoli Satyagraha (1928)

- Leader: Sardar Vallabhbhai Patel.
- Protest against a 22% hike in tax rates.
- The title *"Sardar"* was given to him by the women of Bardoli.

FACTORS THAT LED TO CIVIL DISOBEDIENCE MOVEMENT

- **Calcutta Session, 1928:** In this Session, Nehru Report was accepted.
- **Irwin's Declaration, 1929:** This is also known as *"Deepavali Declaration"*. *Viceroy Lord Irwin* promised Dominion status in the future and a Round Table Conference post-Simon Commission's Report.
- **Delhi Manifesto, 1929:** It outlined several key conditions by Indian leaders' for participating in the Round Table Conference.
- **Lahore Session, 1929:** It was presided by J L Nehru.

Decisions taken:

- 1st Round Conference Table to be boycotted.
- ***Goal:*** *"Purna Swaraj"* (Complete Independence).
- ***31 Dec 1929:*** *Flag was hoisted* by J L Nehru on the banks of *Ravi river* with slogans of *"Inquilab Zindabad"*.
- *26 Jan 1930* was fixed as the *First Independence Day*.
- Congress authorised to launch CDM.
- Gandhi presented his *11 demands* as an ultimatum before launching CDM. Irwin ignored them.

1. Arms Licenses: Issue licenses to Indians for self-protection.
2. Military Expenditure: Reduce military spending by 50%.
3. Political Prisoners: Release political prisoners.
4. Rupee-Pound Rate: Revise the exchange rate (Stronger Rupee).
5. Abolish Salt Law: Remove the tax and government monopoly on salt.
6. Civil Services: Reduce salaries of civil servants by 50%.
7. Coastal Shipping: Reserve coastal shipping for Indian merchants.
8. Import Duty: Impose custom duty on foreign cloth to protect Indian industry.
9. CID: Abolish or reform the Criminal Investigation Department (CID).
10. Land Revenue: Reduce land revenue.
11. Liquor: Total prohibition on intoxicants.

YOU NEED NOT MUG UP THESE 11 DEMANDS.

- ***Dominion Status was first demanded by Tej Bahadur Sapru and M R Jaykar***
- ***"Inquilab Zindabad" slogan was given by Hasrat Mohani (1921)***

CIVIL DISOBEDIENCE MOVEMENT

Dandi March

- *Dandi March was the beginning of Civil Disobedience Movement.*
- ***Time period:*** 12 March-6 April 1930.
- Gandhi marched *241 miles* along with *78 delegates* from *Sabarmati Ashram (Ahmedabad) to Dandi (Navsari) to violate Salt Law* due to which it is also known as *Salt Satyagraha*.
- The *Dandi March* received widespread international attention; Time Magazine initially mocked Mahatma Gandhi but later named him *"Man of the Year"* (1930).

Dharasana Satyagraha (1930)

- Gandhi planned to raid the Dharasana but Gandhi got arrested on May 4, 1930 (before the raid).
- After Gandhi's arrest, *Abbas Tyabji* led the raid in Darshana Salt Works. Following his arrest, it was led by *Sarojini Naidu*, *Imam Sahib*, and *Manilal* (Gandhi's son).

Role of Women:

- *Sarojini Naidu* persuaded Gandhi to include women in the movement.
- *Kamaladevi Chattopadhyay* famously told Gandhi: *"Do not restrict this movement to men alone"*.
- Salt was choosen as the theme because of the govt tax on salt and its monopoly over its production which revealed govt.'s oppressive face.

Campaign across India

- ***In Ryotwari Areas:*** Non-payment of revenue.
- ***In Zamindari Areas:*** No chowkidar tax.
- ***In Central Province:*** Violation of forest laws.
- ***In Assam:*** Students protested against Cunningham Circular.

→ ***Cunningham Circular*** : A circular issued by J.R. Cunningham forced students and parents to sign a pledge of *"good behavior"*.

Participation of Leaders in Different States

- ***Tamil Nadu:*** C Rajagopalachari (led Salt March from Trichinopoly to Vedaranniyam).
- ***Malabar:*** K Kelappan.
- ***Orissa:*** Gopalbandhu Choudhary.
- ***Bihar:*** Ambika Kant Sinha (*Nakhas Pond* was chosen as a site to violate Salt Law).
- ***Peshawar:*** Khan Abdul Ghaffar Khan or Badshah Khan or *Frontier Gandhi*
  - He launched *"Red Shirt Movement"*.
  - ***Established:*** *Khudai Khidmatgar* (Servants of God).
- ***Manipur & Nagaland:*** *Rani Gaidinliu* joined the anti-British struggle at the age of 13, led the *Heraka*

Movement, and was imprisoned for 14 years (released after independence).

Forms of Mobilization

- Prabhat Pheri, Vanar Sena, Manjari Sena were organised for mobilising the masses.

Gandhi-Irwin Pact 1931

- This pact is also known as the Delhi Pact
- It was signed on *5 March between Gandhi and Irwin*.

Irwin's demands to Gandhi:

- Suspend CDM.
- Participate in 2nd Round Table Conference.

Gandhi's demands (which were accepted by Irwin):

1. Release political prisoners, not convicted of violence.
2. Give the confiscated properties back to Indians which are not yet sold to third-parties.
3. Right to produce salt for personal consumption.
4. Right to make salt in coastal villages for personal consumption.

Gandhi's demands (which were not accepted by Irwin):

1. Public inquiry into police excesses.
2. Commutation of death sentence to Bhagat Singh, Sukhdev, and Rajguru.

Karachi Session

- It was held on 29 March 1931 - Presided by Sardar Patel.
  - Gandhi was greeted with black flags by youth angry over the execution of Bhagat Singh.
  - Gandhi-Irwin Pact (or Delhi Pact) was accepted.
  - Congress agreed to participate in 2nd Round Table Conference.
  - *CDM was suspended.*
  - *The goal of Purna Swaraj was reiterated* (for the first time meaning of Puma Swaraj was stated).
  - *Two resolutions were adopted: Fundamental Rights and National Economic Policy.*

Round Table Conference (RTC)

- RTCs were held in London to discuss about Simon Commission Report and future reforms for the country.

3 RTCs were held:

- ***1st:*** Nov 1930-Jan 1931.
- ***2nd:*** Sep 1931-Dec 1931 (it is the only RT where Gandhi and Congress participated).
- ***3rd:*** Nov 1932-Dec 1932.
- *B.R. Ambedkar* attended all *3 RTCs*.

- 2nd RTC failed due to non-acceptance of demands of Congress by British Government. Due to which Congress decided on *29th Dec 1931* to resume the CDM. The then Viceroy *Willingdon* also refused a meeting with Gandhi. On 4th Jan 1932, Gandhi was arrested, finally on *April 1934* Gandhi withdrew the CDM.

■■■

COMMUNAL AWARDS

- The Communal Award was announced by ***British Prime Minister Ramsay MacDonald on 16th August 1932***. It is also known as ***MacDonald Award***.
- It recognised the ***"Depressed Classes" as minorities and provided them a separate electorate*** along with some other communities like Muslims, Sikhs, Christians, Europeans, and Marathas as well.
- ***Mahatma Gandhi strongly opposed*** the separate electorate for Depressed classes, viewing it as a threat to Hindu unity however ***B. R. Ambedkar supported*** the Award, as it ensured political representation and safeguarded the rights of the Depressed classes.

Congress neither accepted nor rejected the Communal Award.

Poona Pact 1932

- The Poona Pact was an agreement between ***Mahatma Gandhi and B. R. Ambedkar***, signed on ***24th September 1932***, at ***Yerwada Central Jail*** in ***Pune***.
- While in prison, Gandhi announced a ***fast unto death*** till the time separate electorates were removed from the Award, which led to an agreement between Gandhi and Ambedkar that discarded the separate electorate.

Key Provisions of Poona Pact

Note: *Madan Mohan Malaviya signed Poona Pact on behalf of Gandhi.*

- No separate electorates for Depressed Classes.
- Number of seats reserved for Depressed Classes would be increased.

Gandhi's Efforts against Untouchability

- ***All India Anti-Untouchability League (1932):*** This League, founded by Mahatma Gandhi was later re-named as the ***Harijan Sevak Sangh***.
- Harijan (Weekly newspaper).

GOVERNMENT OF INDIA ACT 1935

1937 Elections

- Congress formed ministries in all ***7 out of 11 provinces*** (later 8) except in:
- ***Punjab:*** Unionist Party.
- ***Bengal:*** Krishak Praja Party + Muslim League coalition.
- ***Sindh:*** United Party (Coalition).

****For provisions of GOI Act 1935 refer to chapter: "Important Acts" in Polity section.***

CONGRESS SESSIONS

- **1934:** Congress Socialist Party was formed by J PNarayan, Ram Manohar Lohia, A N Dev, Minoo Masani.
- **1936:** Held in Lucknow; All Indian Kisan Sabha (AIKS) was formed by Swami Sahajanand Saraswati.
- **1937:** Faizpur → 1st session to be held in a village (Jalgaon, Maharashtra). This session was presided over by J L Nehru.
- **1938:** Haripura, Gujarat led by ***S C Bose (elected as President of INC)*** marked the beginning of growing ideological differences between Bose and Mahatma Gandhi, though the full rift developed in 1939 during the Tripuri Session.
- ***National Planning Committee (NPC)*** was established in ***1938*** by ***S C Bose***, during the ***Haripura Session***. The ***first chairman*** of this Committee was ***J L Nehru***.
- **1939:** Tripuri Session in Jabalpur (Madhya Pradesh) → ***S C Bose was re-elected as President*** of INC by defeating Gandhi's candidate ***Pattabhi Sitaramayya***, but later ***S C Bose resigned*** from Congress and he formed ***All India Forward Bloc, 1939 in Unnao, Uttar Pradesh*** (as a faction within the Congress).

World War II

- In ***1939***, World War II began → ***It was fought between the Allied Powers*** (Britain, France, USA, USSR) and the ***Axis Powers*** (German, Italy, Japan).
- In ***October 1939***, the INC resigned from all provincial ministries to show protest against Britain's decision to ***involve India in World War II without consulting Indian leaders***.
- After resigning, the INC made offers to ***Viceroy Lord Linlithgow*** regarding India's involvement in World War II.

The demands were:

1. Demand for establishment of Constituent Assembly to draft a Constitution for the Indian people.
2. Demand for establishment of fully responsible Government at both Provincial and Central level.

Autobiography of Hitler: Mein Kampf

The Muslim League observed 22 December 1939 as the "Day of Deliverance" (Youm-e-Najat) to celebrate the resignation of the Congress governments.

AUGUST OFFER 1940

- In ***1940***, ***August Offer*** was sent by Lord Linlithgow under the direction of ***British Prime Minister Winston Churchill*** to secure India's cooperation in World War II. The key Provisions were:

1. The British Government promised to grant Dominion Status for India.
2. Indians could create their own Constituent Assembly themselves with inclusion of more Indian representatives than whites.
3. An advisory war council was to be established.
4. Veto for Minorities: No future constitution would be adopted without the consent of the minorities.

→ However these provisions were rejected by Congress as Congress had declared *"Purna Swaraj"* as their goal.

→ Jawaharlal Nehru completely rejected the British August Offer of 1940, calling it *"dead as a doornail"*.

→ The Muslim League also rejected this proposal.

Individual Satyagraha 1940

- The INC decided to launch the *"Individual Satyagraha"* after the failure of August Offer under the leadership of *Mahatma Gandhi* in *1940* with *Vinoba Bhave* nominated as *first Satyagrahi, J L Nehru* as *second* and *Brahma Dutt* as *the third*.
- **Objective:** To protest against India's forced participation in World War II and to assert the right to freedom of speech, without causing mass disruption to British war efforts.

Revolutionary Socialist Party was established in 1940.

CRIPPS MISSION 1942

Background/Reasons (1941):

- *Threat of Japan:* Rapid Japanese expansion in Southeast Asia and advance up to Burma created fear of invasion of India.
- *International Pressure:* After the Pearl Harbor attack, Franklin D. Roosevelt and Allied nations pressured Britain to grant political concessions to India.
- *Attack on Russia:* Operation Barbarossa by Germany against the Soviet Union (1941) worsened Britain's war position, increasing its urgent need for Indian support (men and resources).
- In *1942, Stafford Cripps* was sent to India with a constitutional reforms. The key proposals were:

1. A Constituent Assembly would be formed to frame a new constitution for the country. This Assembly would have members elected by the provincial assemblies and also nominated by Princely States.
2. India would be granted Dominion Status, allowing self-governance while remaining part of the British Commonwealth.
3. Any province unwilling to join the Indian dominion could form a separate union and have a separate constitution.
4. The transfer of power and the rights of minorities would be safeguarded.

The proposals were rejected by INC. Gandhi famously referred Cripps offer of Dominion Status as *"post-dated cheque drawn on a* failing bank*"*.

QUIT INDIA MOVEMENT

- **July 1942:** *The Congress Working Committee* met at *Wardha, Maharashtra* where *Quit India Resolution* was adopted. It was ratified at *Gowalika Tank, Bombay*.

Quit India Movement

- On *8th August 1942, Mahatma Gandhi launched Quit India Movement* (also known as *August Kranti*) in response to the failure of Cripps Mission. Which was initially not supported by J L Nehru and Hindu Mahasabha.
- The *"Do or Die"* slogan was given *during a speech by Mahatma Gandhi* at the *Gowalia Tank Maidan* or *August Kranti Maidan* in *Mumbai*. The slogan was a call to action for Indians to fight for independence from British rule.
- The very first day all leaders got arrested and that is why this movement was a *leaderless movement*.
- *Aruna Asaf Ali* presided over Congress Working Committee, she also hoisted the Indian Flag at the Gowalika Tank in Mumbai.

Specific Appeals made by Gandhi (during the Quit India Movement):

- To *government servants* Gandhi advised not to resign from their posts but instead urged them to remain loyal to the cause of the INC and work against British policies subtly.
- *Soldiers* were instructed not to resign from their duties but were urged to refuse orders to fire on fellow compatriots.
- Gandhi appealed to *peasants* to withhold rent payments if the landlords or Zamindars were loyal to the British government.
- He encouraged the *people living in princely states* to support their ruler if the ruler was anti-British. If the ruler was pro-British, Gandhi advised them to peacefully oppose the government.

Martyrs

- *Kushal Konwar* was the only martyr of the Quit India phase of the freedom movement who was hanged.
- *Kanaklata Barua* was shot dead by the British forces while leading a procession during QIM.

Underground Activities Carried Out:

- *Usha Mehta:* Launched *underground radio in Bombay* and appealed Indians to join Quit India Movement
- *Parallel government were setup*:
  - *In Ballia by: Chittu Pandey*
  - *In Tamluk by: Jatiya Sarkar*
  - *In Satara by: Prati Sarkar (Y B Chauhan, Nana Patil)*
- **23 March 1943:** *Pakistan Day was observed by Muslim League.*

Jinnah's Reaction:

- *Sarojini Naidu* called Jinnah the *Father of Hindu-Muslim unity* after the Lucknow Pact (1916).
- Due to disagreement (especially with Gandhiji's Non-Cooperation Movement), Jinnah left the Congress for some time and went to London.

• Upon returning to India, he reorganized the Muslim League and finally stuck to the demand for a separate nation as Pakistan through the Lahore Resolution of 1940.

Pakistan Movement

• The word "Pakistan" was coined by *Rahmat Ali* in 1933.

Lahore Resolution (1940):

• It is also called the Pakistan Resolution.

• It was a formal political statement adopted by the All India Muslim League on the occasion of its three-day general session in Lahore, Punjab, from 22 to 24 March 1940.

• A separate homeland for the Muslims of British India was demanded.

• On *23 March 1943 Pakistan Day* was observed by the Muslim League.

Mediation between Congress and Muslim League

• **1944:** C. Rajagopalachari gave *C R Formula* (Rajagopalachari Formula) in response to the growing tensions between the INC and the Muslim League.

• **Desai Liaquat Pact 1945:** It was an unsuccessful agreement between *Bhulabhai Desai* (from Congress) and *Liaquat Ali Khan* (from Muslim League).

• **1945:** *Wavell Plan* was proposed by then *Viceroy Lord Archibald Wavell* as an attempt to resolve the political *deadlock between* the *INC* and the *Muslim League*. This plan was discussed in Shimla Conference; however it failed.

In September 1945, World War II completely ended with the US bombings. In August 1945, US bombed in Hiroshima and Nagasaki (two cities of Japan) on 6 August and 9 August respectively. The bomb dropped on Hiroshima was known as "Little Boy". While the bomb dropped on Nagasaki was known as "Fat Man" which was more powerful than the "Little Boy" and that is from where we came up with the idea of naming this book and our GK MCQ Book (Little Boy).

INDIAN NATIONAL ARMY (INA)

• The *Indian National Army (INA)* was founded during World War II to fight against British rule in India.

• It was initially formed in *1942* by *Mohan Singh with Indian Prisoners of Wars in Singapore* (it was later handed to *Rash Behari Bose* who again transferred the leadership to *S C Bose*).

Birth anniversary of S.C. Bose is celebrated every year as "Parakram Divas".

Subash Chandra Bose

• He was born in *Cuttack* in *23rd Jan 1897.*

• In *1942*, he met *Hitler* in Germany using a pseudo name *"Orlando Mazzotta"*.

• The Indian National Army (Azad Hind Fauj) was reorganised by Bose in *Singapore* in *1943*.

• He founded *"Free India Legion/Tiger Legion"* in 1941 in *Berlin, Germany.*

• He formed a women regiment named after *Rani Lakshmibai* led by Captain Lakshmi Swaminathan.

• *14 April 1944*, Colonel *Shaukat Ali Malik* of the Azad Hind Fauj (INA) hoisted India's tricolor flag in *Moirang, Manipur*, with the help of Japan. (This was the first time the tricolor was hoisted on Indian soil by the Azad Hind Fauj.)

• On 15th August, Japan (Emperor Hirohito) surrendered to Allied powers, marking the end of World War II.

• ***He died on: 18th August*** in a plane crash.

• S C Bose was called as *"Patriot of Patriots"* by *Gandhi.*

• In *1944*, he was the person to give *"Father of Nation"* title to Gandhi through Singapore Radio.

Famous Slogans by S C Bose

• *"Delhi Chalo"*

• *"Give me blood, and I shall give you freedom"*

• *"Jai Hind"*

The Indian struggle 1920-1942 was authorised by S C Bose.

INA trials

• The Indian National Army trials (also known as the INA trials and the Red Fort trials) was the British Indian trial by court martial of a number of officers of the Indian National Army (INA) between *November 1945* and *May 1946.*

• ***First INA trial was held against:*** *Prem Kumar Sehgal, Shah Nawaz Khan* and *Gurbaksh Singh Dhillon* in *Red Fort* in *1945.*

• Congress came in defence of these INA soldiers and formed a committee which included Jawaharlal Nehru, Bhulabhai Desai, Asaf Ali, Tej Bahadur Sapru, Kailash Nath Katju, and others.

• **18th February 1946:** The *ratings* (sailors in lowest rank) of *Royal Indian Navy (RIN)* revolted against British due to the discrimination and poor conditions and this led to a historic *Royal Indian Navy Mutiny.* This event began at the *HMIS Talwar* (a shore establishment in Bombay) and spread to Calcutta, Karachi and Bombay, against the *poor working conditions* (low pay, poor food quality, etc.).

→ The mutiny was called off at the behest of the Congress and the Muslim League.

CABINET MISSION PLAN

• In *1945*, elections were held in Britain where *Labour Party* under the leadership of *Clement Atlee* formed the government.

• In *March 1946, Clement Attlee (then PM of Britain)* sent a delegation called the Cabinet Mission consisting of:

• *Lord Pethick-Lawrence (Chairman), Sir Stafford Cripps and A. V. Alexander.*

• **Objective:** Transfer of power and constitution-making.

Provisions in Cabinet Mission Plan

• The plan proposed a united India, rejecting the demand for a separate Pakistan.

• The Cabinet Mission Plan proposed a three-tier administrative structure for British India:

- *Federal Union* at the top level,
- *Groups of provinces* at the middle level,
- *Individual provinces* at the bottom level.

• ***Provincial were divided into three groups:***

- ***Group A:*** Hindu-majority provinces (Madras, Bombay, UP, Bihar, Odisha, Central Provinces).
- ***Group B:*** Muslim-majority provinces (Punjab, NWFP, Sindh, Balochistan).
- ***Group C:*** Bengal and Assam.

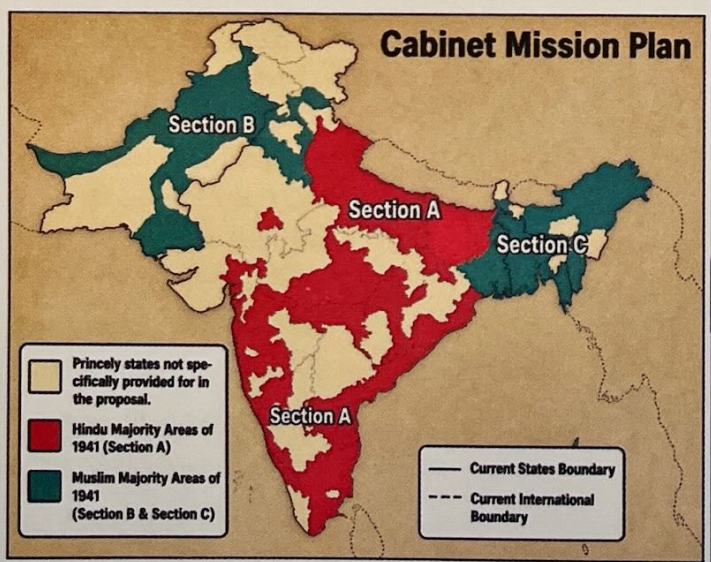
• Central Government to have power over defense, foreign affairs, and communications.

• Provinces to have full autonomy and residual powers.

• Princely States were free to negotiate their status, either to join with Britishers or Successor Governments.

• Constituent Assembly to draft a new constitution; members would be elected by provincial assemblies.

• Interim Government to function till the new constitution and government were formed.



Note:

• **Attlee's Declaration:** On 20 February 1947, British Prime Minister Clement Attlee announced in the House of Commons that the British government intended to transfer power to responsible Indian hands before 30 June 1948.

Response to the Cabinet Mission Plan

• ***Indian National Congress:*** It accepted the plan partially but opposed the idea of grouping, fearing it was a step toward partition.

• ***Muslim League:-*** It initially accepted the Cabinet Mission Plan, despite no explicit provision for Pakistan, hoping that the grouping of provinces would eventually lead to a separate state. However, when Muhammad Ali Jinnah realized that grouping was not strictly mandatory, he called for ***"Direct Action Day" (16 August 1946)*** demanding Pakistan, this led to horrific communal violence in Calcutta, known as the ***"Great Calcutta Killing."***

• ***Noakhali Riots*** (Oct-Nov 1946) in Noakhali (now in Bangladesh) began after the Calcutta violence. Mahatma Gandhi visited Noakhali to establish peace.

MOUNTBATTEN PLAN

• Date: 3 June 1947.

• The Mountbatten Plan which formed the basis for Indian Independence Act proposed for the Partition of India into two Dominions namely India and Pakistan. That's why it is also known as ***Partition Plan***.

• Under this Plan, the Princely States were given the option to ***join either India or Pakistan or remain Independent***.

- ***Out of 565 Princely States, 562 joined either India or Pakistan and 3 did not join initially. They were: J&K, Hyderabad and Junagarh.***

• ***Lord Louis Mountbatten:*** The last Viceroy of British India and the first Governor-General of independent India (1947–48).

• ***C. Rajagopalachari:*** Only Governor-General of independent India (because later this post was removed).

Note: ***To see Provisions of Indian Independence act 1947 refer to chapter "Important Acts" in Polity section.***

AFTER INDEPENDENCE

• ***Operation Polo (September 1948):*** Also known as the Hyderabad Police Operation. This operation was led by Major General J.N. Chaudhuri. The Nizam of Hyderabad, Mir Osman Ali Khan, surrendered on 17 September 1948, after which Hyderabad became a part of India.

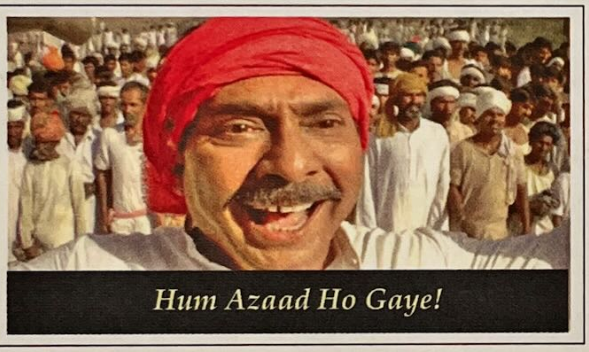
• ***Maharaja Hari Singh*** signed the ***"Instrument of Accession"*** on 26 October 1947, officially making Jammu and Kashmir a part of India.

• ***Vinayak Damodar Savarkar*** (Hindu Mahasabha): He was a strong supporter of 'Akhand Bharat' (Undivided India) and an opponent of partition. He was not formally a leader of the RSS, but Godse considered him his political guru.

- ***Birla House Incident:*** On 30 January 1948, at Birla House in Delhi, during the evening prayer, Nathuram Godse touched Gandhiji's feet and then assassinated him by firing three bullets.
- ***Reason for Assassination:*** Godse believed that the partition of the country happened due to Gandhiji's non-violence and Muslim appeasement policy. (Immediate Cause was the release of ₹55 crore to Pakistan by the Indian Government due to Gandhiji's fast).
- ***Execution:*** Tried at the Red Fort, ***Nathuram Godse*** and his accomplice Narayan Apte were hanged in Ambala Jail on 15 November 1949.

Bangladesh Liberation War in 1971 led to the separation of East Pakistan (now Bangladesh) from West Pakistan (now Pakistan). This war took place during the tenure of Indira Gandhi.

In 1972, the Shimla Agreement was signed by Indira Gandhi (then Prime Minister of India) and Zulfikar Ali Bhutto (then President of Pakistan) to restore peace between two countries. It has been suspended by Pakistan as a move of retaliation after India suspended Indus Water Treaty 🚰.



Hum Azaad Ho Gaye!

- Mahatma Gandhi was in Noakhali (present day Bangladesh) on ***August 15, 1947***, the day India gained independence.

■■■

GOVERNOR-GENERALS OF INDIA

Lord Warren Hastings *(1773-1785)*

- Regulating Act (1773) → 1st Governor General of Bengal.
- Pitt's India Act (1784).
- 1st Anglo-Maratha War (1775-1782) → Treaty of Salbai signed (1782)
- 2nd Anglo-Mysore War (1780-1784).
- Asiatic Society of Bengal (1784) formed.

Lord Cornwallis *(1786-1793)*

- 3rd Anglo-Mysore War (1790-1792) → Treaty of Seringpatnam.
- Permanent Settlement (1793)
- Death: India (tomb in Ghazipur, Uttar Pradesh).
- He is known as Father of Indian Civil Services.

Lord Wellesley *(1798-1805)*

- 2nd Anglo-Maratha War (1803-1805).
- 4th Anglo-Mysore War (1799).
- Treaty of Bassein (1802).

Lord Minto *(1807-1813)*

- Treaty of Amritsar (1809) signed between Maharaja Ranjit Singh and Britishers.

Lord Hastings *(1813-1823)*

- 3rd Anglo-Maratha War (1817-1819).
- Anglo-Nepal War (1814-1816) → Treaty of Sagauli signed.
- Ryotwari System introduced by Munro and Reed.

Lord William Bentinck *(1828-1835)*

- First Governor-General of India.
- Abolition of Sati (1829).
- Suppression of Thugs.
- He abolished Circuit Courts.
- He is known as Father of Modern Education in India → Macaulay's Minute (1835) during his tenure.

Lord Metcalfe *(1835-1836)*

- He is known as the Liberator of Indian Press.

Lord Auckland *(1836-1842)*

- 1st Anglo-Afghan War (1838-1842).

Lord Hardinge *(1844-1848)*

- 1st Anglo-Sikh War → Treaty of Lahore signed.

Lord Dalhousie *(1848-1856)*

- Doctrine of Lapse (1848).
- 1st railway line laid down (1853) → from Bombay to Thane (34 km).
- Widow Remarriage Act (1856).
- Postal Act Telegraph lines spread across.
- Wood's Dispatch (1854) → Magna Carta of Indian Education.
- He founded Public Works Department (PWD).
- 2nd Anglo-Sikh War (1848-1849).

VICEROYS

Lord Canning *(1856-1862)*

- He became the 1st Viceroy of India.
- 1857 Revolt.
- Government of India Act (1858) was passed.

Lord Mayo *(1869-1872)*

- 1st Unsynchronised (not complete) Census was held during his tenure (1872).
- He established Statistical Survey of India.
- Sher Ali Afridi killed him in Andaman Jail.

Lord Lytton *(1876-1880)*

- Arms Act (1878).
- He brought Vernacular Press Act (1878) to ban local newspapers.
- First Delhi Durbar (1877) to proclaim Queen Victoria as Empress of India.
- 2nd Afghan War (1878-1880).
- He lowered the maximum age of eligibility for Civil Services (reduced the age from 21 to 19 years).

"Bengal Gazette" by James Augustus Hickey was the 1st Newspaper in India (1780).

Lord Ripon *(1880-1884)*

- Ilbert bill was introduced in 1883.
- He repealed Vernacular Press Act.
- 1st Synchronised (complete) Census held during his tenure (1881).
- He is known as Father of Local Self-Government.
- Hunter Commission (1882) was setup which was related to Education.
- 1st Factory Act (1881).

Lord Dufferin *(1884-1888)*

- Formation of INC (1885).

Lord Curzon *(1899-1905)*

- Partition of Bengal (1905).
- Indian Universities Act.
- Calcutta Corporation Act.
- Curzon-Kitchner controversy.
- Younghusband Mission (to Tibet).

Lord Minto II ***(1905-1910)***

- Muslim League formation (1906) by Aga Khan.
- Surat Split.

Lord Hardinge II ***(1910-1916)***

- 3rd Delhi Durbar for King George (1911).
- During his tenure, capital shifted from Calcutta to Delhi.
- Royal Commission on Civil Services was appointed in 1912.

Lord Chelmsford ***(1916-1921)***

- Government of India Act, also known as Montagu-Chelmsford Reforms (1919).
- Rowlatt Act (1919).
- Jallianwala Bagh Massacre (1919).

Lord Reading ***(1921-1926)***

- Chauri Chaura Incident (1922).
- Kakori Train Incident (1925).
- Establishment of Swaraj Party (1923).
- Repeal of Press Act (1910) and Rowlatt Act (1919).

Lord Irwin ***(1926-1931)***

- Visit of Simon Commission (1928).
- Lahore Session of Congress (1929).
- Dandi March (1930).
- 1st Round Table Conference.

Lord Willingdon ***(1931-1936)***

- 2nd Round Table Conference.
- 3rd Round Table Conference.
- Government of India Act (1935).

Lord Linlithgow ***(1936-1944)***

- World War II.
- August Offer (1940).
- Individual Satyagrah (1940).
- Quit India Movement (1942).
- Cripps Mission (1942).

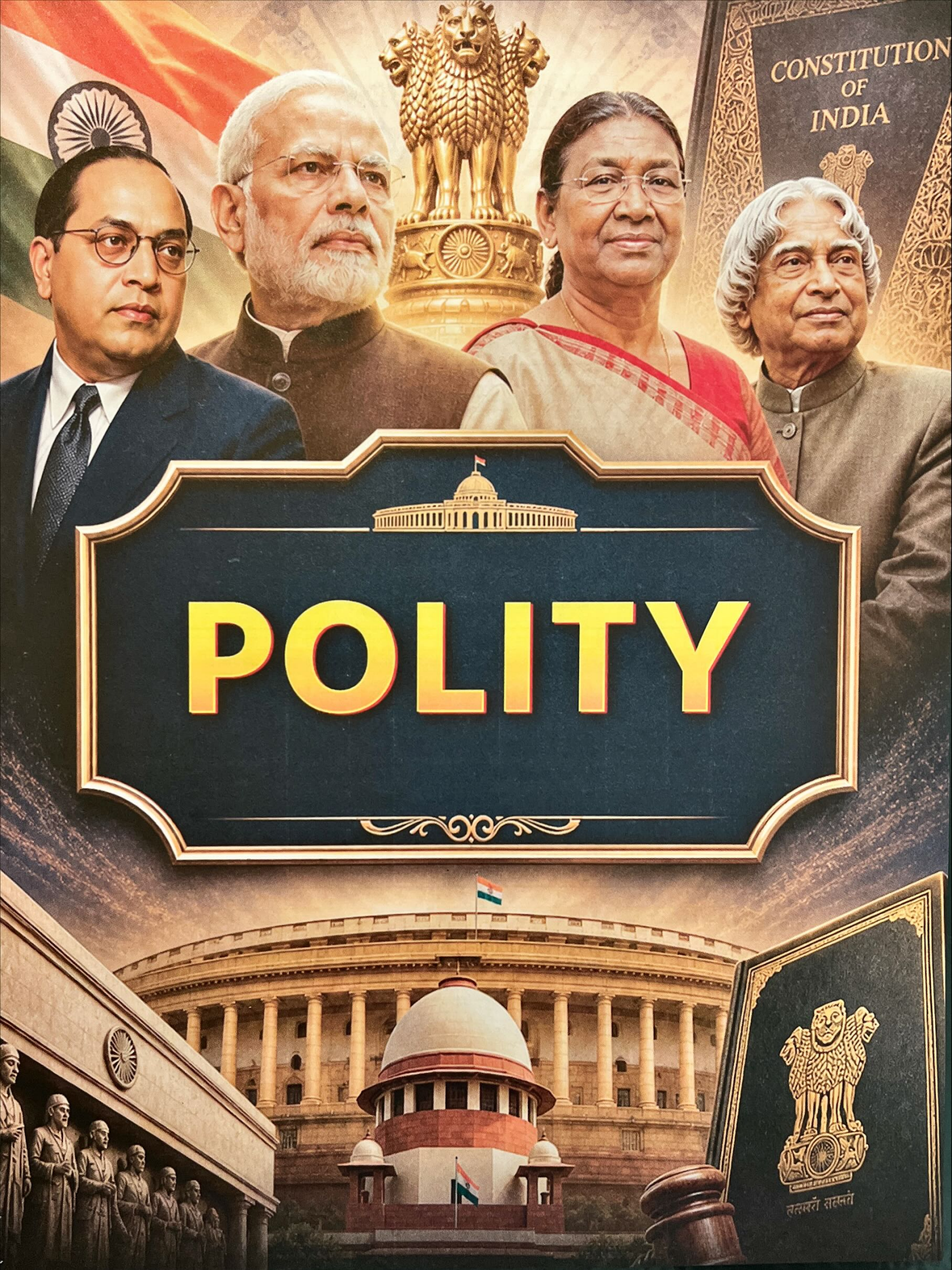
Lord Wavell ***(1944-1947)***

- CR Formula (1944).
- Wavell Plan (1945).
- Cabinet Mission Proposals (1946).
- Observance of Direct Action Day (16 August 1946).

Lord Mountbatten ***(1947-48)***

→ Last British Governor General of India.

- ***Only Indian Governor General of India: C. Rajagopalachari.***


CONSTITUTION
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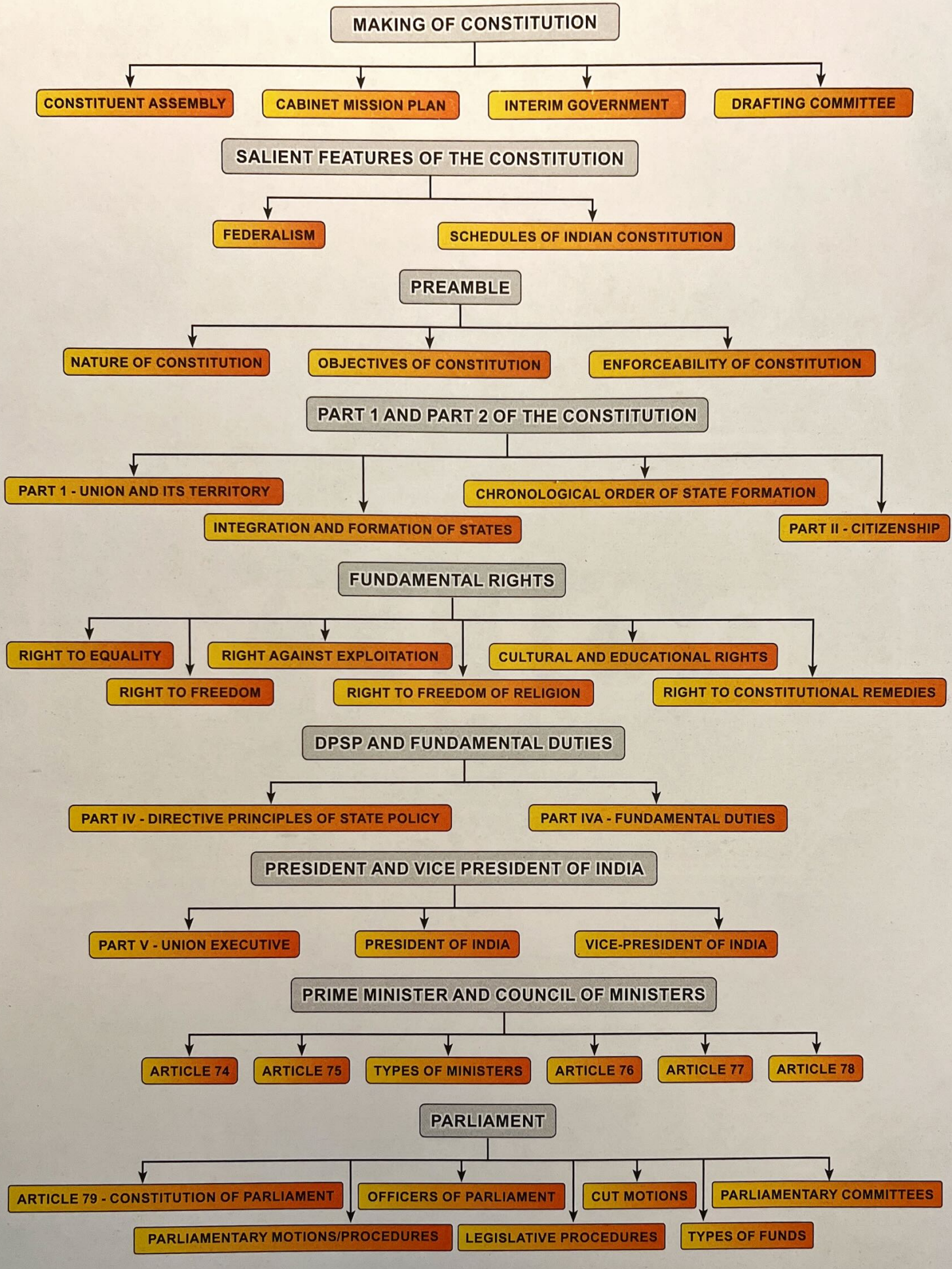
MAKING OF CONSTITUTION
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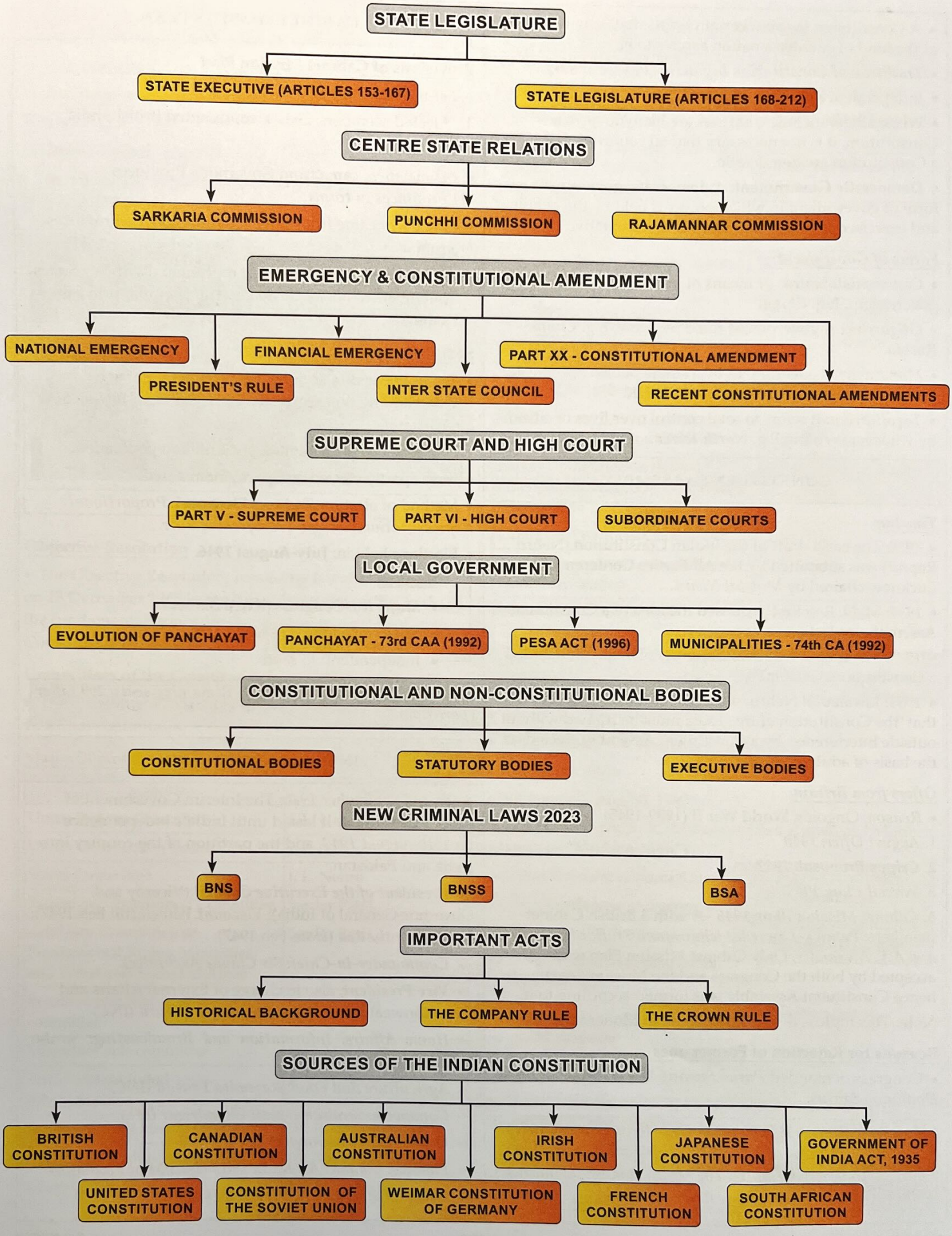
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- A Constitution lays out certain ideals that form the basis of the kind of country a nation aspires to be.
- *Tradition of Constitution began in: USA (in 1787).*
- Independence of USA: 4th July 1776.
- While all democratic countries are likely to have a Constitution, it is not necessary that all countries that have a Constitution are democratic.
- **Democratic Government:** A democratic government is a form of government in which power is held by the people and exercised through their elected representatives.

Forms of Government:

- ***Communist:*** Source or means of production controlled by government. E.g. ***China***.
- ***Oligarchic:*** A government ruled by a few. E.g. ***China, Russia***.
- ***Monarchic:*** A government by a single person specifically King or a monarch. E.g. ***Saudi Arabia, UK***.
- ***Totalitarian:*** It refers to total control over lives of citizens by whoever is ruling E.g. ***North Korea***.

CONSTITUENT ASSEMBLY

Timeline

- ***1928:*** The early draft of the Indian Constitution (Nehru Report) was submitted by the All Parties Conference at Lucknow chaired by ***Motilal Nehru***.
- ***1934:*** M. N. Roy first proposed the idea of a Constituent Assembly for India.
- ***1935:*** The Indian National Congress officially demanded a Constitutional Assembly.
- ***1938:*** Jawaharlal Nehru, on behalf of the INC, declared that 'the Constitution of free India must be framed without outside interference, by a Constituent Assembly elected on the basis of adult franchise'.

Offers from Britain

- ***Reason:*** Ongoing World War II (1939-1945)

1. ***August Offer: 1940***
2. ***Cripps Proposal: 1942***
3. ***Wavell Plan: 1945***
4. ***Cabinet Mission Plan: 1946*** → with 3 British Cabinet members: ***Pethick-Lawrence (chairman), Stafford Cripps, and A.V. Alexander.*** Only Cabinet Mission Plan was accepted by both the Congress and the Muslim League, hence Constituent Assembly was formed according to it.

Note: This topic is discussed in detail in Modern history.

Reasons for Rejection of Former ones

- Congress demanded ***Purna Swaraj***, but Britishers offered ***Dominion Status***.

> ***Dominion Status: It is a status given to certain countries that allowed them to be self-governing while remaining part of the British empire. The term "Dominion" means "that which is mastered or ruled".***

CABINET MISSION PLAN

Provisions of Cabinet Mission Plan

- ***Total seats: 389***

1. Elected Members: ***296*** → represented British India.

Out of 296:

- ***292 members*** came from Governor's Provinces ***(11 provinces in total)***.
- ***4 members*** came from Chief Commissioner's Provinces. ***(4 provinces)***

2. ***Nominated Members: 93*** → represented Princely States (members to be nominated by rulers of that princely state).

Seats Allocation

- Seats allocated to each British province were to be divided among three principal communities: ***Muslim, Sikh and General.***
- One seat was to be allotted per 1 million population.
- It was partly elected and partly nominated.
- Method of election (Indirect Elections): ***Proportional Representation + Single Transferable Vote.***
- Elections held in: **July-August 1946**.

  Results:
  - ***Majority:*** Congress (INC): ***208 seats***
  - Muslim League: ***73 seats***
  - Independent: ***15 seats***

> ***After boycott of Muslim League, Remaining seats: 299 (after partition).***

INTERIM GOVERNMENT

- ***On 2nd September 1946:*** The Interim Government of India was formed. It lasted until India's independence on ***15th August 1947***, and the partition of the country into India and Pakistan.

→ ***President of the Executive Council*** (Viceroy and Governor-General of India): ***Viscount Wavell*** (till Feb 1947); ***Lord Mountbatten*** (from Feb 1947)

→ ***Commander-in-Chief: Sir Claude Auchinleck***

→ ***Vice President,*** also in charge of External Affairs and Commonwealth Relations: ***Jawaharlal Nehru (INC)***

→ ***Home Affairs, Information and Broadcasting: Sardar Vallabhbhai Patel (INC)***

→ ***Agriculture and Food: Rajendra Prasad (INC)***

→ ***Commerce: Ibrahim Ismail Chundrigar (ML)***

→ ***Defence: Baldev Singh (INC)***

→ ***Finance: Liaquat Ali Khan (ML) (1st PM of Pakistan)***

→ ***Health: Ghazanfar Ali Khan (ML)***

→ *Labour: Jagjivan Ram (INC)*

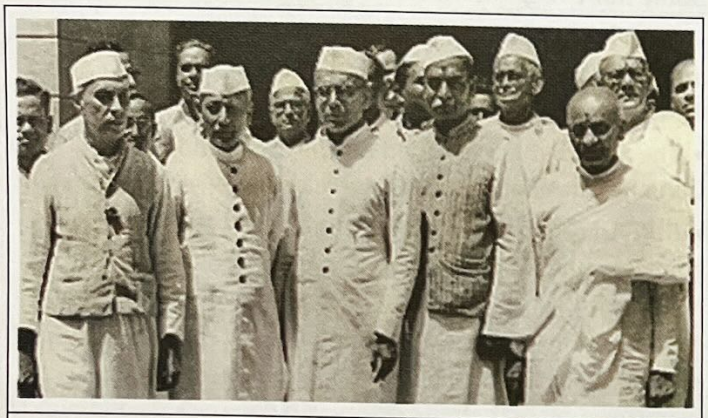
→ *Law: Jogendra Nath Mandal (ML)*

→ *Education and Arts: C. Rajagopalachari (INC)*

→ *Railways and Communication, Post and Air: Abdur Rab Nishtar (ML)*

→ *Industries and Supplies: John Mathai (INC)*

• The 1st Interim National Government was announced on 24th Aug 1946.



Interim Government

Objective Resolution

• The Objective Resolution, moved by Jawaharlal Nehru on 13 December 1946 in the Constituent Assembly, laid the fundamental principles and philosophy for the Indian Constitution & was adopted on 22 Jan 1947.

Committees of the Constituent Assembly

• The Constituent Assembly of India formed *8 Major* and *13 Minor* committees.

Major Committees of Constituent Assembly

Committee	*Head*
Union Powers Committee	J. L. Nehru
Union Constitution Committee	J. L. Nehru
States Committee	J. L. Nehru
Provincial Constitution Committee	Sardar Patel
Advisory Committee on Fundamental Rights, Minorities, and Tribal and Excluded Areas	Sardar Patel
Fundamental Rights sub committee	J.B. Kripalani
Minorities sub-committee	H.C. Mukherjee
Tribal and excluded areas sub-committee	A.V. Thakkar
Drafting Committee	Dr. B. R. Ambedkar
Rules of Procedure Committee	Dr. Rajendra Prasad
Steering Committee	Dr. Rajendra Prasad

Minor Committees of Constituent Assembly

Committee	*Head*
Finance and Staff Committee	Dr. Rajendra Prasad
Ad-hoc Committee on the National Flag	Dr. Rajendra Prasad
Credentials Committee	Alladi Krishnaswami Ayyar
House Committee	B. Pattabhi Sitaramayya
Committee on Chief Commissioners Provinces	B. Pattabhi Sitaramayya
Order of Business Committee	Dr. K. M. Munshi
Committee on the Functions of the Constituent Assembly	G. V. Mavalankar
Ad-hoc Committee on the Supreme Court	S. Varadachariar
Ad-hoc Committee on Citizenship	S. Varadachariar
Expert Committee on the Financial Provisions of the Union Constitution	Nalini Ranjan Sarkar
Linguistic Provinces Commission	S. K. Dhar
Special Committee to Examine the Draft Constitution	J. L. Nehru
Press Gallery Committee	Usha Nath Sen

DRAFTING COMMITTEE

• Set up on: **29th August 1947**

• *Total members of Drafting Committee: 7*

• Sat for 141 days

• 1st meeting: Aug 30, 1947

→ **Chairman:** *Dr. B. R. Ambedkar* (also known as **"Modern Manu"** or **"Modern Man"**)

→ *Alladi Krishnaswami Ayyar*

→ *N. Gopalaswami Ayyangar*

→ *Muhammad Saadulah*

→ *B. L. Mitter* (replaced by **N. Madhav Rau**)

→ *D. P. Khaitan* (*replaced by T. T. Krishnamachari*)

→ *K. M. Munshi*

- Chief Draftsman - S.N. Mukherjee
- Legal/Constitutional Advisor - B.N. Rau

Drafts of Constituent Assembly

• *21 Feb 1948:* First draft was published. It took 8 months for people of India to discuss.

• *21 Oct 1948:* 2nd draft

• *4 Nov 1948:* B. R. Ambedkar introduced the final draft before Constituent Assembly.

B.R. Ambedkar was elected to the Constituent assembly from Bengal (in place of Jogendranath Mandal) in July 1946 (before Partition) , but after Partition he was elected from Bombay Presidency (after M.R. Jayakar resigned).

- ***1st reading:*** 5 days (4th Nov 1948-9th Nov 1948).
- ***2nd reading:*** 10 months and 3 days (15 Nov 1948-17 Oct 1949).
- ***3rd reading:*** Completed on 26 Nov 1949.

211 members were present on the 1st day of the constituent assembly.

Important Sessions

- ***Total sessions held: 11 sessions for 165 days.***
- Total time taken for drafting the Constitution: ***2 years 11 months 18 days.***
- No. of members who signed constitution on 24th Jan 1950- 284 (including 15 female members).
- ***Budget: 64 lakhs*** **(to frame the Constitution).**
- ***1st Session: 9-23rd December 1946***
- ***10th Session: 6-17th October 1949***
- ***11th Session: 14-26th November 1949*** (also the last session).
- ***26th November 1949:*** Constitution was ***adopted*** (this day is also celebrated as the ***"Constitution Day"***)
- Constitution was enforced/Commenced on 26th January 1950, Celebrated as ***Republic Day***. But few provisions of the constitution that came into force on 26th November 1949 were:
  - Citizenship (Article 5-9)
  - Elections (Article 324-329)
  - Provisional Parliament
- The reason for choosing this date is because on the same day in 1930 ***Purna Swaraj*** day was celebrated following the Lahore session of the Congress (1929).

Originally, our Constitution consisted of 395 Articles, 8 Schedules, 22 Parts and a Preamble.

Functions of the Constituent Assembly other than Making of the Constitution

- 1st meeting: 9 Dec 1946
- Whenever the assembly met as the constituent body it was chaired by ***Dr. Rajendra Prasad*** and when it met as the legislative body it was chaired by ***G.V. Mavalankar***.

→ Temporary President (before elections): ***Dr. Sachchidananda Sinha***

→ President (after elections): ***Dr. Rajendra Prasad***

→ Vice President: ***V. T. Krishnamachari and H. C. Mukherjee***

- It functioned as the ***'First Parliament of India'***.
- It adopted National Flag on ***22 July, 1947***
- It adopted National Anthem ***("Jana Gana Mana"→ by Rabindranath Tagore) and National Song ("Vande Mataram"→ by Bankim Chandra Chatterjee)*** on ***24 January, 1950***.
- It ***ratified*** India's membership of the Commonwealth in ***May 1949***.
- Elected Dr. Rajendra Prasad as the 1st President of India on 26 Jan 1950.

Some more Significant facts to know:

- ***Sarvepalli Radhakrishnan*** was one of the speakers after Jawaharlal Nehru to address the Parliament on the midnight of 15th Aug 1947.
- The ***Socialist Party*** called for the dissolution of the Constituent Assembly and its re-election by adult suffrage.
- ***B.R. Ambedkar*** stated "on the 26th Jan 1950, we are going to enter a life of contradictions. In politics we will have equality and in social and economic life we will have inequality."
- Designer of Indian National Flag-Pingali Venkayya (Approved by Mahatma Gandhi in a congress meeting in Vijayawada in 1921).
- ***Somnath Lehri*** said "Constituent assembly was a conspiracy of Britishers"(book-Samyobad) and Somnath Lehri was a writer and editor of the left newspaper Swadhinata.
- ***HM Seervai*** - Authored book 'Constitutional law of India'- A comprehensive commentary on the Indian Constitution.
- The printed records of the Constituent assembly discussions were compiled into 12 Volumes.
- Constitution Calligraphers:
  - ***English: Prem Bihari Narain Raizada***
  - ***Hindi: Vasant Krishan Vaidya***
- Constitution decorated by: ***Nand Lal Bose and Beohar Rammanohar Sinha***
- Secretary of Constituent Assembly: ***H. V. Iyengar***
- India's constitution is the largest written constitution, its symbol is the ***Elephant***.
- Language of the Constitution: ***English***

Important Female members of The Constituent Assembly

- ***Rajkumari Amrit Kaur*** → 1st Health minister
- ***Sucheta Kriplani*** → 1st female Chief Minister of Uttar Pradesh
- ***Sarojini Naidu*** → 1st Governor of Uttar Pradesh

• Indian Constitution is the *lengthiest written Constitution* in the world.

• Originally Constitution contained: *395 Articles, 22 Parts, 8 Schedules*

• Presently it contains: More than *448 Articles, 25 Parts, 12 Schedules*

CA, here, refers to Constitutional Amendment

Written Constitution	*Unwritten Constitution*
• Compiled and structured in a systematic form.	• Not structured
• Formally constituted	• Not formally constituted
• Not easy to amend	• Easy to amend
• Eg: India	• Eg: UK

• ***A mix of Rigidity & Flexibility :*** Some parts of Indian Const. can be amended by simple majority (Flexible) & some need special majority (Rigid). The topic is discussed in detail in Amendment Chapter.

FEDERALISM

• This refers to the existence of more than one level of government in the country.

• *Three tier* government exists in India:
- Union/Centre
- States
- Local Bodies (Panchayats & Municipalities)

• Under federalism, the states are not merely agents of federal government, they derive their authority from Constitution itself.

• India has a: *Federation with a unitary bias / Strong Centre*

Federal features vs Unitary features

Federal Features	*Unitary Features*
Written Constitution	Single Constitution
Supremacy of the Constitution	Single Citizenship
Rigidity of the Constitution	Flexibility of the constitution
Separate State Services	All India Services
Bicameralism	Emergency provisions
Dual Government	Appointment of governors by centre
Independent Judiciary	Integrated Judiciary

Comments on Indian Federalism

→ *Quasi Federal: By K.C. Wheare*

→ *Cooperative Federalism: By Granville Austin*

→ *Bargaining Federalism: By Morris Jones*

→ *Federalism with centralising tendency: By Ivor Jennings*

• *India has a Parliamentary form of Government (taken from UK), having-*

3 organs of government (No Strict Separation of Powers)
- *LEGISLATIVE - makes laws*
- *EXECUTIVE - carries out laws*
- *JUDICIAL - evaluates laws*

SCHEDULES OF INDIAN CONSTITUTION

Schedule 1: Names of States and UTs and their territorial jurisdiction.

Schedule 2: Provisions relating to emoluments and allowances.

President, VP, Governor, Speaker + Deputy Speaker (LS + LA), Chairman Deputy Chairman (RS + LC), Judges (SC + HC), CAG

Schedule 3: Oaths and affirmations (Union + State)

Ministers, MPs, MLAs, Judges, CAG

Schedule 4: Allocation of seats in Rajya Sabha.

Schedule 5: Provisions relating to administration of scheduled areas and scheduled tribes.

→ Tribal advisory council only advises the Governor of the respective state.

→ The President has the authority to declare areas as "Scheduled Areas" under the 5th schedule under Art. 244(1).

Andhra Pradesh, Chhattisgarh, Maharashtra, Jharkhand, Madhya Pradesh, Gujarat, Himachal Pradesh, Odisha, Rajasthan, Telangana

Schedule 6: Provisions related to administration of tribal areas of Assam, Tripura, Meghalaya, Mizoram
→ States with Autonomous District Council (ADC).

→ ADC's are vested with Legislative, Judicial and Executive Powers including the authority to manage land, Forest and Village Administration.

TRICK: ATM without Money (Manipur is not included)

Schedule 7: 3 lists containing subject in which Union and States can make laws. (Federal Provisions) **Union list, State list, Concurrent list**

Union List Subjects: Initially 97, presently 100 subjects (Defence, arms and ammunition, atomic energy, citizenship, airways, inter-state trade and commerce, banking, foreign affairs, labour and mines, census, etc.)

State List Subjects: ***Initially 66, presently 61 subjects.*** (Public order, local government, health, pilgrimage, liquor, agriculture, fisheries, betting and gambling, Co-operative societies, Land, Lotteries).

Five scenarios in which Parliament/Union can legislate on State list subjects-

1) National Emergency (Article 250): Law valid 6 months after emergency ends.
2) President's Rule (Article 356): Law continues until repealed/amended later or if LS passes a resolution through Simple Majority.
3) If two or more state legislature requests (Article 252): Permanent until repealed by parliament, states cannot amend it themselves.
4) To enforce international treaty (Article 253).
5) If Rajya Sabha gives Parliament this power (by special majority) in National Interest (Article 249): A resolution thus passed is valid for one year + 6 months after expiry.

Concurrent List Subjects: ***Initially 47, presently 52 subjects. Both State and Centre can make laws on subjects given in this list. But if both make law Centre's law will prevail over States' law. States' law can prevail only in 1 case when the States' Bill is given assent by President.*** (Marriage and divorce, criminal laws, code of criminal procedure, insolvency and bankruptcy, trade and labour disputes, electricity, education, weights and measures, etc.)

Parliament can later nullify such a state law by passing another law on the same subject.

Residuary List:
- ***These subjects are not included in Union/State/Concurrent list.***
- ***Parliament has the power to legislate on residuary subjects.***

- ***Subjects Transferred through 42nd Amendment*** (From State list to Concurrent list):

→ Education
→ Forests
→ Weights and Measures
→ Protection of wild animals and birds
→ Administration of justice

Amendment: a formal change to law, contract, constitution, or other legal document.

Schedule 8: Official languages
- Originally there were ***14 languages.***
- Presently there are ***22 languages.***
- Here's a list of constitutional amendments that added following languages to the list:

21st CAA, 1967 → ***Sindhi*** was added.
71st CAA, 1992 → ***Konkani, Manipuri, Nepali*** ***(Trick: KMN)***
92nd CAA, 2003 → ***Bodo, Dogri, Maithili, Santhali*** ***(Trick: BDSM)***
96th CAA, 2011 → It changed the name ***'Oriya' to 'Odia'***

Classical languages of India

TRICK	Classical languages	+ Newly added in 2024
Tu →	Tamil	Marathi
Shuru →	Sanskrit	Pali
Toh →	Telugu	Prakrit
Kar →	Kannada	Assamese
Mai →	Malayalam	Bengali
Aariya →	Odia	

Schedule 9: Provisions related to land reforms and Zamindari system. ***(Added through Ist CA: 1951)***

Schedule 10: Provisions relating to disqualification of MPs and MLAs on grounds of defection. Added through ***52nd CA: 1985***

Schedule 11: Provisions relating to Panchayat.
Added through ***73rd CA: 1992,*** 29 functional matters

Schedule 12: Provisions relating to Municipalities.
Added through ***74th CA: 1992,*** 18 functional matters

TRICK to learn Schedules → TEARS OF OLD PM
T: Territory
E: Emoluments
A: Affirmation and oath
R: Rajya Sabha
S: Scheduled areas
O: Other scheduled areas
F: Federal provisions
O: Official languages
L: Land provision
D: Defection
P: Panchayat
M: Municipalities

Note : Sources of constitution are provided at the end.

PREAMBLE

- 'We the people of India' taken from USA.
- On 26th January 1950, the Preamble (originally) declared India a Sovereign Democratic Republic. Later this was amended by the 42nd CA (1976) which added the words Socialist and Secular.
- Decoration by: Beohar Ram Manohar Sinha, Nand Lal Bose.
- Borrowed from: USA.
- Language of Preamble: taken from Australia.
- In the case of 'Ashwini Kumar Upadhyay v. Union of India (Nov, 2024) the Supreme Court rejected the petition challenging the insertion of "Socialist" and "Secular" into the preamble.
- It is an introductory statement in a Constitution, which states the reasons and guiding values of the Constitution.
- It contains the summary or the essence of the Constitution.
- It tells us about the philosophy of the Constitution.
- It was made after the entire Constitution was compiled.
- It is a modified version of the **Objective Resolution presented by J.L. Nehru** before the Constituent Assembly.

Comments on Preamble

ID Card of Constitution: *N. A. Palkhivala*

Political Horoscope of Constitution: *K. M. Munshi*

Jewel set: *Pt. Thakur Das*

Keynote of the Constitution: Ernest Barker (in his book- Principles of Social and Political Theory).

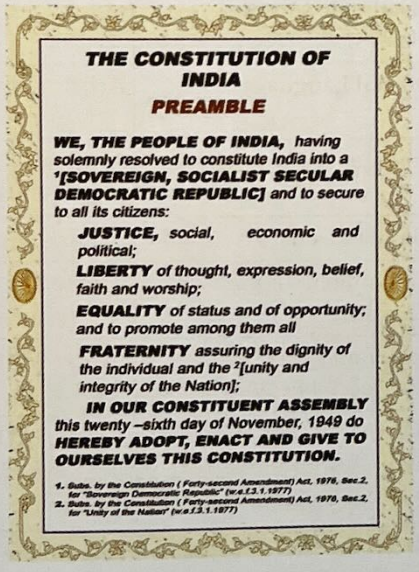
Pt. Thakur Das : Soul of the Constitution, Most precious part, Yardstick which can measure the worth of the Constitution.

Hidayatullah: Preamble resembles the declaration of independence of the USA but is more than a Declaration.

Understanding the Preamble

- **Source of power of Constitution**

→ *"WE, THE PEOPLE OF INDIA....."*



THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a **[1][SOVEREIGN, SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens:

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the [2][unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty –sixth day of November, 1949 do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f.3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Unity of the Nation" (w.e.f.3.1.1977)

- This shows that the constitution has been drawn up and enacted by the people through their representatives, and not handed down to them by a king or any outside powers.

- **Nature of the Constitution**

SOVEREIGN

- People have supreme right to make decisions on internal as well as external matters. ***No external power can dictate*** the government of India.

SOCIALIST

- Wealth is generated socially and should be ***shared equally*** by society.
- Government should regulate the ownership of land and industry to ***reduce socio-economic inequalities.***

Example: Russia

→ ***Capitalistic: USA***

→ ***Mixed: India***

- The term 'Socialism' derives its inspiration from the Russian Revolution.
- Types of Socialism:
- ***Radical Socialism:*** The idea of ending private ownership of businesses and wealth and making everything shared so that everyone is equal (Classless Society).
- ***Gandhian Socialism:*** A system promoting Non-violence, Self-reliance and fair wealth distribution through village-centered economy.
- ***Nehruism Socialism:*** A system emphasizing state-controlled development to achieve economic growth and social equality. It is also known as Mixed Socialism.

SECULAR

- Citizens have complete ***freedom to follow any religion or no religion at all.*** There is no official state religion.
- Government treats all religious beliefs and practices equally and impartially.
- In India, secularism follows a positive concept. (Involvement of state in religious matters).

DEMOCRATIC

- The government functions according to a set of constitutional rules and principles.
- ***A Government Of the People, By the People, For the People-As said by Abraham Lincoln***
- Democracy means a system of 'Government by consent'- **John Locke** (Father of Liberalism). Book- ' Two Treatises of Government' 1689.
- ***Direct Democracy:*** A form of government in which citizens directly participate in the decision-making process and vote on laws and policies themselves. ***(Eg:- Switzerland, Uruguay, Latvia, Lithuania etc).***
- ***Indirect Democracy (Representative Democracy):*** A form of government in which citizens elect representatives who make laws and take decisions on their behalf. ***(Eg:- Canada, India, USA, UK, etc).***

UK is not a Republic State.

REPUBLIC

A system of government in which the ***head of the state is elected by the people*** and not based on a hereditary succession.

Objectives of the Constitution

JUSTICE

- Citizens cannot be discriminated on the grounds of caste, religion, and gender. Social inequalities have to be reduced.
- **Three types of justice are given in Preamble**: *Social, Economic and Political*

LIBERTY

- There are no unreasonable restrictions on a citizen in what they think, how they wish to express their thoughts and the way they wish to follow up their thoughts in action.
- ***Five forms of liberty are given in Preamble:*** *Thought, Expression, Belief, Faith, and Worship*

EQUALITY

- ***All are equal before the law.*** The traditional social inequalities must end. The government should ensure equal opportunities for all.
- ***Two types of equality are given in Preamble:*** *Status and Opportunity.*

FRATERNITY

- All of us should behave as if we are members of the same family. No one should treat a fellow citizen as inferior.

The terms *"Liberty, Equality, Fraternity and Republic"* are taken from *France and the Ideals of Justice* are taken from *Russia*.

Is Preamble a Part of Constitution and is it Amendable?

Berubari Union Case: 1960

- Supreme Court held that-

i) The Preamble is ***not a part*** of the Constitution & hence cannot be amended.

ii) It is just a key to understanding the Constitution.

iii) It is ***not legally enforceable.***

Kesavananda Bharati Case: 1973

- In this case, Supreme Court Overruled the Berubari view and held that –

i) ***The Preamble is a part of the Constitution and hence can be amended under Article 368.***

ii) It reflects the ***basic structure*** of the Constitution (decided by the Supreme Court).

LIC of India Case: 1995

i) Reaffirmed the Kesavananda Bharati case ruling.

Preamble has been amended only once in 1976 through 42nd Constitutional Amendment.
It added the terms: ***Integrity, Socialist, Secular (TRICK: ISS/SIS)***

Enforceability of Preamble

- It is not enforceable in the Court of Law.
- It is neither a source of Power nor Restriction to the legislature, but it can be considered as an aid to the legal interpretation of the Constitution.

Parts of Indian Constitution:

Parts	*Subject*	*Article No.*
Part I	The Union and Its Territory	Articles 1 to 4
Part II	Citizenship	Articles 5 to 11
Part III	Fundamental Rights	Articles 12 to 35
Part IV	Directive Principles of State Policy	Articles 36 to 51
Part IVA	Fundamental Duties	Article 51A
Part V	The Union	Articles 52 to 151
Part VI	The States	Articles 152 to 237
Part VIII	The Union Territories	Articles 239 to 242
Part IX	The Panchayats	Articles 243 to 243O
Part IXA	The Municipalities	Articles 243P to 243ZG
Part IXB	The Co-operative Societies	Articles 243ZH to 243ZT
Part X	The Scheduled and Tribal Areas	Articles 244 to 244A
Part XI	Relations Between the Union and the States	Articles 245 to 263
Part XII	Finance, Property, Contracts and Suits	Articles 264 to 300A
Part XIII	Trade, Commerce and Intercourse within the Territory of India	Articles 301 to 307
Part XIV	Services under the Union and States	Articles 308 to 323
Part XIVA	Tribunals	Articles 323A to 323B
Part XV	Elections	Articles 324 to 329A
Part XVI	Special Provisions Relating to Certain Classes	Articles 330 to 342A
Part XVII	Official Language	Articles 343 to 351A
Part XVIII	Emergency Provisions	Articles 352 to 360
Part XIX	Miscellaneous	Articles 361 to 367
Part XX	Amendment of the Constitution	Article 368
Part XXI	Temporary, Transitional and Special Provisions	Article 369 to 392
Part XXII	Short Title, Commencement, Authoritative Text in Hindi and Repeals	Article 393 to 395

- Part 7 has been deleted by 7th CA 1956 and new Parts: IV-A (by 42nd CA 1976) , IX-A (by 74th CA 1992), IX-B (by 97th CA 2011), and XIV-A (by 42nd CA 1976) have been added.

PART I - UNION AND ITS TERRITORY [Article 1-4]

- *Article 1: Name and Territory of the Union*

1(1) India, that is Bharat, shall be a Union of States.

1(2) The States and the territories, thereof, shall be as specified in the First Schedule.

1(3) The territory of India shall comprise of-

(a) The territories of the States;

(b) The Union territories specified in the First Schedule; and

(c) Such other territories as may be acquired in future.

Type of Polity

- *India is not a Federation but a Union of States.*
- Term 'federation' has nowhere been mentioned in the Constitution.

→ ***Federation of State:*** A new entity that is formed through a treaty or an agreement between various federating units. ***E.g. USA***

→ ***Union of States:*** No agreement between the Federating units (States). They do not have a right to secede from the Union. ***Eg. India***

- *India is an Indestructible Union of Destructible states.*
- US is an indestructible union of indestructible states.

- *Article 2: Admission or Establishment of new States*

- Parliament may by law admit into the Union, or establish, new states on such terms and conditions as it thinks fit.

- *Article 3: Formation of new States and alteration of areas, boundaries, or names of existing States*

- Parliament may by law—

(a) form a new State by separation of territory from any State or by uniting two or more States or parts of States or by uniting any territory to a part of any State;

(b) increase the area of any State;

(c) diminish the area of any State;

(d) alter the boundaries of any State;

(e) alter the name of any State

NOTE: Bill related to subject matters given in Article 3 shall be introduced with the prior recommendation of the President, who shall refer this bill to the legislature of the state concerned.

- ***5th Constitutional amendment empowered the President to set a time limit for state legislature to express its views.***

Difference between Article 2 and 3: Article 2 talks about incorporating foreign territory into India while Article 3 talks about the changes in the existing states.

- *Article 4: Laws made under Article 2 and 3 to provide for the amendment of first and fourth Schedules*

4(2) Any law made under Article 2 or Article 3 that amends the First or Fourth Schedule of the Constitution shall not be considered a constitutional amendment under Article 368. Therefore, such a law can ***be passed by a simple majority in Parliament.***

- If Indian territory is to be ceded, then amendment is needed under Article 368. *(Berubari Union case, 1960)*
- ***100th CA (2015):*** India-Bangladesh boundary agreement
- India transferred 111 enclaves to Bangladesh while Bangladesh transferred 51 enclaves to India.

INTEGRATION AND FORMATION OF STATES

Integration of the Princely States

- In 1947, *562 out of 565* princely states agreed to accede to the Indian Union by signing the Instrument of Accession. The following 3 Major princely states initially refused to join India, but later-
- On 26 October 1947, Maharaja Hari Singh signed the Instrument of Accession, thereby acceding the princely state of *Jammu and Kashmir* to the Dominion of India and seeking military assistance following an invasion by tribal forces supported by Pakistan.
- *Junagarh* became part of India after conducting a *referendum.*
- *Hyderabad* was integrated into India through a military operation called Operation POLO in September 1948.
- In 1950, a four fold Classification of states was done: Part A, Part B, Part C, Part D.

Committees on Linguistic Reorganisation of States

Dhar Committee (1948)

- *Chairman: S. K. Dhar*
- Recommended that states should be reorganized based on administrative convenience, not linguistic factors.

JVP Committee (1948)

- *Members: Jawaharlal Nehru, Vallabhbhai Patel, and Pattabhi Sitaramayya*
- It rejected the idea of forming states on a linguistic basis as well.

1952: **Death of *Potti Sriramulu* after a hunger strike for a separate Telugu speaking state led to the formation of Andhra Pradesh *(became the 1st linguistic state of India, 1953).***

Fazl Ali Commission / State Reorganisation Commission (1953)

- *Members: Justice Fazl Ali, K. M. Panikkar, and H. N. Kunzru*
- Rejected the theory of ***"One language, One state"*** but supported reorganising states on a linguistic basis.

State Reorganisation Act, 1956

- The State Reorganisation Act of 1956 was passed based on the recommendations of the Fazl Ali Commission.
- ***It removed the fourfold classification of states and created 14 States + 6 Union Territories, on 1st Nov, 1956***
- With regard to North India, it sought to divide the huge Hindi speaking belt into four states: Bihar, UP, MP, and Rajasthan.
- In the east, the existing provinces could stay as they were with minor adjustments.
- The commission rejected the demand for tribal states to be carved out of Bihar and Assam.
- The commission did not agree with the creation of a Sikh state.

CHRONOLOGICAL ORDER OF STATE FORMATION

TRICK: AAM GUNAH HAI MAIM TUSSI GAO AUR MOJ LO

- ***Aa*** → Andhra Pradesh ***(Full fledged state on 1st Nov, 1956)***
- ***M*** → Maharashtra, 1st May 1960
- ***Gu*** → Gujarat, 1st May 1960
- ***Na*** → Nagaland, 1963
- ***H*** → Haryana, 1966 ***(Chandigarh became UT.)***
- ***Hai*** → Himachal Pradesh, 1971
- ***Mai*** → Meghalaya, 21st January 1972
- ***M*** → Manipur, 21st January 1972
- ***Tu*** → Tripura, 21st January 1972
- ***SSi*** → Sikkim, 16th May 1975
- ***Goa*** → Goa, 30th May, 1987 (became 25th state of India by 56th CA after being a UT since 1961)
- ***Aur*** → Arunachal Pradesh, 20th February 1987 ***(55th CA, 1986)***
- ***Moj lo*** → Mizoram, 20th February 1987 ***(53rd CA, 1986)***

Bombay Reorganisation Act, 1960 bifurcated Bombay in two new states – Maharashtra and Gujarat.
- ***They both commemorate their statehood on 1st May.***

Karnataka, Kerala, Andhra Pradesh, Chhattisgarh, Haryana and Madhya Pradesh celebrate their statehood on 1st November.

Additional Points to Remember

- ***12th CA, 1962:*** ***Goa(UT) + Daman + Diu (Still a UT)***

Operation Vijay, 1961: launched by Indian Government to liberate Goa, Daman & Diu from Portuguese rule.

- ***10th CA, 1961:*** ***Dadra & Nagar Haveli*** (UT) → Now merged with Daman and Diu on 26th January 2020.
- ***22nd CA, 1969:*** ***Meghalaya*** was created within Assam.
- ***Mizoram and Arunachal:*** Created as a UT→ once part of **NEFA** (North-East Frontier Agency)
- ***Chhattisgarh, Uttarakhand, Jharkhand:*** gained statehood in ***2000***. They were created out of Madhya Pradesh, Uttar Pradesh and Bihar, respectively.
- ***Telangana:*** became ***29th state of India on June 2, 2014***
- ***Sikkim (Special Case):***

→ was earlier ruled by ***Chogyal Dynasty,***

→ Became an ***associate state under Article 2A*** (35th Amendment, 1974)

→ Gained ***complete statehood in 1975, by 36th Amendment.***

→ Became ***22nd*** state of India.

Article 239: A Union Territory is administered by the President of India.

→ Article 239AA added by 69th CA 1991, designated Delhi as the National Capital Territory (NCT). It provided for a Legislative Assembly in Delhi with restricted authority on land, police and public order.

Article 239A : Inserted by 14th CA, 1962, Parliament may, by law, create a Legislature or a Council of Ministers for certain Union Territories (it specifically referred to the Union Territory of Pondicherry).

Chronological Order of UT's

- 1956 (State Reorganisation) Act:

→ Andaman & Nicobar - 1 Nov 1956

→ Delhi - 1 Nov 1956

→ Lakshadweep - 1 Nov 1956

- 1961-1962 (Integration of Former Colonies):

→ Dadra and Nagar Haveli - 11 Aug 1961

→ Goa, Daman and Diu – 20 December 1961 (liberated from Portuguese rule).

→ Puducherry - 16 Aug 1962 (transferred from France)

- 1966 (Punjab Reorganisation Act):

→ Chandigarh - 1 Nov 1966

→ Daman and Diu became a separate UT in 1987 (after Goa became a state).

- 31st Oct 2019 : Jammu and Kashmir reorganized into UT of J&K and Ladakh and legislative council of J&K formally abolished.
- Out of 107 seats in the Legislative Assembly of Jammu and Kashmir 24 remain vacant for PoK.

Articles Related to Special Provisions for Some States at a Glance:

TRICK: NAM AASMA GK

Article No.	Subject Matter
371	Special provision with respect to the states of *Maharashtra and Gujarat*.
371-A	Special provision with respect to the state of **Nagaland**.
371-B	Special provision with respect to the state of **Assam**.
371-C	Special provision with respect to the state of **Manipur**.
371-D	Special provisions with respect to the state of **Andhra Pradesh** or the state of Telangana
371-E	Establishment of Central University in **Andhra Pradesh**.
371-F	Special provisions with respect to the state of **Sikkim**.
371-G	Special provision with respect to the state of **Mizoram**.
371-H	Special provision with respect to the state of **Arunachal Pradesh**.
371-I	Special provision with respect to the state of **Goa**.
371-J	Special provisions with respect to the state of **Karnataka**.

N A M A A S M A G K

PART II - CITIZENSHIP
[Article 5-11]

Article 5: Citizenship at the commencement of the Constitution

- A person shall be deemed to be a citizen of India on 26 January 1950, if they fulfill any of the following condition-

(a) Born in India

(b) Either of the parents was born in India or,

(c) Has been an ordinary resident of India for at least 5 years immediately before 26 January, 1950

Single citizenship: Taken from UK (Britain)

- ***Article 6:*** Persons who migrated from Pakistan to India before 19 July 1948 were granted citizenship automatically.
- ***Article 7:*** Persons who migrated from India to Pakistan after 1st March 1947 were not considered citizens of India, unless they returned to India with a permit for resettlement or permanent return.
- ***Article 8:*** Persons of Indian origin residing outside India may acquire Indian citizenship by registering at the Indian embassy in their country of residence.
- ***Article 9:*** Provided that if any person voluntarily acquired the citizenship of a foreign State, he/she will no longer be a citizen of India.
- ***Article 10:*** Continuance of rights of citizenship.
- ***Article 11:*** Parliament to regulate the right of citizenship by law.

Citizenship Act 1955:

Deals with the provisions of Citizenship ***after 26 Jan, 1950***.

Aquisition of Citizenship –

1. ***By Birth (sec-3):***

- ***Jus Soli (Right of Soil):*** Before 1 July 1987, any person born in India automatically acquired Indian citizenship, irrespective of the nationality of the parents.
- ***Jus Sanguinis (Right of Blood):*** Due to concerns regarding illegal immigration, the law was amended. For persons born after 3 December 2003, citizenship by birth is granted only if at least one parent is an Indian citizen and the other is not an illegal immigrant at the time of birth.

2. ***By Descent (sec-4):*** A person born outside India can acquire Indian citizenship by descent if either of the parents is an Indian citizen and the birth is registered at the Indian consulate within one year of birth.

3. ***By registration (sec-5):*** granted to Indian-origin individuals, spouses of Indian citizens, or minor children who have resided in India for 7 years.

4. ***By Naturalisation (sec-6):*** granted to foreign nationals who have been –

- Residing in India for 12 years (11 years in the preceding 14 years + 1 year immediately before application).
- They must know one Indian Language mentioned in the 8th schedule.
- Third Schedule of Citizenship Act 1955, mentions qualifications for Naturalisation.

Note: The Citizenship (Amendment) Act, 2003 provides that an illegal migrant cannot acquire Indian citizenship through registration or naturalization. It also laid the foundation for the creation of the National Register of Citizens (NRC).

5. ***By incorporating a territory (sec-7):*** When a new territory becomes part of India, the Government of India specifies which persons of that territory shall be granted Indian citizenship.

Can lose Citizenship through:

1. ***Renunciation*** (voluntarily gives up Indian citizenship)

2. ***Termination*** (voluntarily acquired citizenship of other country without informing)

3. ***Deprivation*** (if acquired citizenship by fraud, false documents, or during war helped an enemy country)

4. Disloyalty to the Constitution.

5. Continuous residence outside India for seven years.

6. Imprisonment for two years within five years after registration.

7. Communication or association with an enemy country during war.

Citizenship

- Before the commencement of the Constitution (26 Jan 1950)
- Article (5-8)
- After 26 Jan 1950
- Citizenship Act, 1955

Overseas Citizen of India (OCI)

The Overseas Citizen of India (OCI) Scheme was introduced in 2005 through an amendment to the Citizenship Act, 1955.

Note: The Person of Indian Origin (PIO) Scheme and the Overseas Citizen of India (OCI) Scheme were merged in 2015 to simplify the system for people of Indian origin living abroad.

Restrictions on OCI cardholders:

1) No right to vote in elections.
2) Not eligible for public services or government posts.
3) Not permitted to own agricultural property in India.
4) Indian passport is not issued to OCI holders, as they are foreign citizens.

Benefits for OCI cardholders:

1) Lifelong multiple-entry visa to visit India.
2) Facilities similar to NRIs in economic, financial, and educational fields.
3) Permission to buy or sell immovable property, except agricultural land, plantation property, or farmhouses.
4) Eligible to practice certain profession.

Recent Amendment in Citizenship Act, 1955

Citizenship Amendment Act, 2019 (Section 6B): People from 6 communities → ***Hindu, Sikh, Parsi, Jain, Christian, Buddhist*** of 3 countries ***Bangladesh, Afghanistan, Pakistan*** can acquire citizenship through ***Naturalization*** i.e. –

- Entered India on or before 31st December 2014,
- Must have lived in India for at least 6 years (instead of 12 years earlier).

Assam Accord Citizenship Amendment Act 1985:

- Section 6A of the Citizenship Act, 1955 is a special provision arising from the 1985 Assam Accord, setting a March 25, 1971, cutoff for citizenship for migrants in Assam. It grants citizenship to those who entered before 1966.

Point to REMEMBER

- In India Both Citizens By Birth and Citizens By Naturalisation (acquired citizenship) are eligible for the office of President unlike in USA where Naturalisation is not eligible to become President.

PART III: FUNDAMENTAL RIGHTS [Article 12-35]

Fundamental rights are a set of legally enforceable rights.

Salient Features of Fundamental Rights

Fundamental Rights –

- are not absolute. (but have limits)
- are not 'Sacrosanct' or Permanent.
- can be curtailed during emergency (but **Article 20 and 21 can never be suspended**).
- are justiciable in nature. (One can approach the court if they are violated.)

Basic Pointers

- They are borrowed from the Constitution of USA. (Bill of Rights).
- They are contained in **Part III** of the Constitution → *Article (12-35)*
- They are termed as *"Conscience of Constitution"*
- They seek to implement ***political democracy***.
- They are referred to as the *"Magna Carta of India"*
- Originally there were **7** fundamental rights, but currently there are 6 Fundamental Rights (Right to property was removed from *Part III in 1978 by 44th CA, It is now a legal right under Article 300-A, Part XII of the constitution*)
- ***Doctrine of Waiver:*** It means voluntarily giving up a known legal right or claim.
- Six Fundamental Rights given in the constitution are:

→ ***Right to Equality:*** *Article 14-18*

→ ***Right to Freedom:*** *Article 19-22*

→ ***Right against Exploitation:*** *Article 23-24*

→ ***Right to Freedom of Religion:*** *Article 25-28*

→ ***Cultural and Educational Rights:*** *Article 29-30*

→ ***Right to Constitutional Remedies:*** *Article 32*

Fundamental Rights in detail:

Article 12: Definition of State

- It defines the term "State" mentioned in part III which includes the Government and Parliament of India and the Government and the Legislature of each of the States and all local or other authorities within the territory of India or under the control of the Government of India.

Note: BCCI and NCERT do not fall under the definition of state.

Article 13: Laws Inconsistent with or in Derogation of the Fundamental Rights

- ***Article 13(1):*** Any law made before the commencement of constitution shall be declared null and void by judiciary if it violates Fundamental Rights.
- ***Doctrine of Eclipse: based upon 13(1):*** A law that violates Fundamental Rights becomes inoperative to that extent but is not completely void.
- ***Article 13(2):*** Any law made after the Constitution that violates Fundamental Rights is void to the extent of the violation.
- ***Article 13(3):*** Law includes any ordinance, order, by-law, rule, regulation, notification, in the territory of India.
- ***Article 13(4):*** This article shall not apply to any amendment made under Article 368.
- Marbury v. Madison (1803) is the landmark U.S. Supreme Court case that first established the principle of judicial review.

Article 14-18: Right to Equality

Article 14: Equality before Law and Equal Protection of laws

Exception: President, MLAs / MPs, governor, foreign dignitaries cannot be arrested in civil/criminal matters.

→ **A. V. Dicey** considered equality before law to be a fundamental principle of Rule of Law.

Equality Before Law	*Equal Protection of Law*
This is a negative concept taken from UK.	This is a positive concept taken from USA.
States that everyone should be treated equally in the eyes of the law.	Like should be treated alike under the law.

The Anwar Ali Sarkar Case, 1952 laid the foundation for the "reasonable classification" test, under Article 14, ensuring fairness and equality.

Article 15: Prohibition of Discrimination on Grounds of Religion, Race, Caste, Sex or Place of Birth

15(1) The State shall not discriminate against any citizen on grounds only of religion, race, caste, sex, place of birth.

15(2) No citizen shall, on these grounds, be subject to any disability, liability, restriction or condition with regard to-

(a) Access to shops, public restaurants, hotels and places of public entertainment; or

(b) The use of wells, tanks, bathing ghats, roads and places of public resort maintained wholly or partly out of State funds.

15(3) the State can make special provisions for ***women and children***, e.g. few Metro seats are reserved for women.

15(4) the State can make special provision for the ***advancement of Scheduled Castes and the Scheduled Tribes.*** Added through Champakam Dorairajan case which lead to 1st CA(1951).

15(5) Inserted by the 93rd CA 2005, it allows the State to make special provisions, including reservations, for socially and educationally backward classes, SCs and STs in educational institutions.

15(6) Added by the 103rd CA 2019, it allows the State to provide up to 10% reservation for Economically Weaker Sections (EWS).

Article 16: Equality of Opportunity in Matters of Public Employment

16(1) Equality of opportunity for all citizens in matters relating to ***employment or appointment*** to any office under the state.

16(2) No citizen shall, on grounds only of religion, race, caste, sex, descent, place of birth, residence, be ineligible for, or discriminated against in respect of, ***any employment or office under the state.***

16(3) Parliament can set rule that gives ***preference to people who are residents*** of the area when it comes to local employment or appointments.

16(4) State can make rules to reserve jobs or positions for ***"backward classes"*** who are underrepresented in the state services.

16(4A) Introduced by the 77th CA 1995, it empowers the State to provide reservation in promotion with consequential seniority for SCs and STs in state services if they are not adequately represented.

16(4B) Introduced by the 81st CA 2000, it allows the carry forward of unfilled reserved vacancies (Doctrine of advancement) to subsequent years.

16(5) Allows religious institutions such as temples, mosque, churches to require that their employees belong to the same religion.

16(6) Introduced by the 103rd CA 2019 , it permits up to 10% reservation for Economically Weaker Sections (EWS) in public employment.

(***Article 235:*** claims of SCs and STs shall be taken into consideration in matters of public employment).

Cases/Commission Related to article 16(4):

- ***Kalelkar Commission (1953)***

→ 1st Backward Class commission ***(Chairman: Kaka Kalelkar)***

- ***Mandal Commission (1979)***

→ 2nd Backward Class commission ***(Chairman: BP Mandal)***

→ Recommended 27% reservation to **OBCs**

→ Implemented by Prime Minister ***V.P. Singh in 1990.***

- ***Indra Sawhney Case (1992) - also known as Mandal case.***

→ Public Interest Litigation by advocate Indira Sawhney.

→ The Supreme Court upheld the 27% reservation for OBCs in government job, but also set a 50% cap on total reservations.

→ Creamy-layer is to be identified in OBC are not entitled to reservation.

> ***Public Interest Litigation (PIL) is taken from USA's constitution.***
> ***Father of PIL in India: Justice PN Bhagwati.***
> ***Hussainara khatoon v. State of Bihar (1979): 1st reported case of PIL***

Article 17: Abolition of Untouchability

→ The state and any private individual are prohibited from practicing untouchability.

- The term 'Untouchability' has nowhere been defined in the constitution.
- The Untouchability Offences Act 1955 was replaced by Protection of Civil Rights Act 1976.

Article 18: Abolition of Titles

→ No title, other than being a military or academic distinction, shall be conferred by the State.

Eg: Maharaja, Rai Bahadur, etc.

→ No citizen of India shall accept any title from any foreign state.

→ No person, holding any office of profit shall receive "Title" from any foreign state without the consent of the President.

→ Civilian awards are decorations and not titles, as held in Balaji Raghavan v. Union of India (1996).

Article 19-22: Right to Freedom

Article 19: Protection of certain rights regarding freedom of speech, etc.

TRICK - SAAMRO

19(1): All citizens shall have the right-

"Hallmark of Democracy" ← ***"Hall mark of Democracy"***

- **S** → **(a)** to freedom of **speech and expression**
- **A** → **(b)** to assemble peacefully and without **arms**;
- **A** → **(c)** to form **associations or unions** or cooperative societies;
- **M** → **(d)** to **move freely** throughout the territory of India
- **R** → **(e)** to **reside and settle** in any part of the territory of India;
- **O** → **(g)** to practise any profession, or to carry on any **occupation, trade or business.**

19(2): **Reasonable restriction** can be imposed on the grounds of Public order, decency, morality, sovereignty, integrity, defamation, contempt of court etc.

Hidden Rights under Article 19:

- *Right to Internet (Anuradha Bhasin vs Union of India case, 2020)*
- *Right to Information (Raj Narayan vs State of UP, 1975)*
- Information must be provided under the Right to Information (RTI) Act, 2005 within 30 days of receipt of the application for general requests.

Important Judgments :

- ***Romesh Thapar v. State of Madras (1950):*** The Supreme Court held that the freedom of the press is an integral part of Article 19(1)(a).
- ***Shreya Singhal v. Union of India (2015):*** The Supreme Court struck down Section 66A of the IT Act as unconstitutional for violating freedom of speech under Article 19(1)(a).
- ***People's Union for Civil Liberties (PUCL) v. Union of India (2004):*** The Court held that the Right to Information is part of the freedom of speech and expression under Article 19(1)(a).

- *97th Amendment added Right to form Cooperative societies under Article 19(1)(c)*
- *Article 19(f), Right to Property, has been omitted by 44th CA, 1978.*

Article 20: Protection in respect of conviction for Offences

20(1) No ex-post-facto law: No person shall be subject to a penalty greater than that prescribed by law in force when the crime was committed.

20(2) No double jeopardy: A person must not be punished twice for the same offence.

20(3) No self-incrimination: A person cannot be compelled to provide information or testify against oneself. But have to submit blood specimen or thumb impressions, if asked.

Article 21: Protection of Life and Personal Liberty

→ No person shall be deprived of his life except according to the procedure established by law. ***(Borrowed from the Japanese constitution)***

→ The **foremost right** among right to freedom is Right to life and Personal Liberty.

Here are some of the following rights that have been declared as part of Article 21:-

- Right to sleep.
- Right to freedom from noise pollution.
- Right to shelter.
- Right to privacy.
- Right to free education upto 14 years of age.
- Right to good health.
- Right against public hanging.

- *Article 20 and 21 can never be suspended.*
- *Golden Triangle (14,19,21): Core of Fundamental Rights protecting individual freedom in India.*

Landmark Cases & Interpretations—

A. K. Gopalan Case: 1950

- The Supreme Court of India took a **narrow** view of Article 21 and ruled that it does not guarantee "Due process of law."

Maneka Gandhi Case: 1978

- The Supreme Court overturned the Gopalan case ruling.
- Took a wide stance on Article 21 and introduced the "Due Process of Law."
- It expanded the interpretation of Article 21 and ***made Right to Travel abroad- a Fundamental Right to personal liberty.***
- Included some rights under Article 21 namely Right to Health, Shelter, Speedy trial, Information, Sleep, Electricity, Privacy →

KS Puttaswamy case affirmed that the Right to Privacy is an intrinsic part of right to life and personal liberty.

- Through landmark public interest litigations, ***M.C. Mehta*** established the right to a pollution-free environment as a fundamental right under Article 21 of the Indian Constitution. Doctrine of Absolute Liability was given by SC in 1987.
- ***Joseph Shine v. Union of India (2018):*** Adultery was decriminalized; Section 497 IPC was struck down.
- ***Navtej Singh Johar (2018):*** Judgment decriminalized homosexuality by partially striking down Section 377 IPC, upholding dignity, privacy, and equality of LGBTQ+ individuals.
- ***Right to Die Debate:***

→ ***Maruti Shripati Dubal v. State of Maharashtra (1987):*** Right to die is part of the right to life.

→ ***P. Rathinam v. Union of India (1994):*** Right to die is not part of the right to life.

→ ***Common Cause v. Union of India (2018):*** Recognized passive euthanasia and living will as valid.

- ***Hussainara Khatoon v. State of Bihar (1979):*** Recognized the right to speedy trial as part of Article 21.
- ***Olga Tellis v. Bombay Municipal Corporation (1985):*** Recognized the right to livelihood as part of right to life.
- ***Aruna Ramchandra Shanbaug v. Union of India (2011):*** Legalized passive euthanasia (Right to Die with Dignity).
- ***Harish Rana vs. Union of India (2026)- Right to Die with Dignity***: The SC in a petition concerning a patient in a permanent vegetative state permitted passive euthanasia

holding that the Right to life under ***Article 21*** includes the right to die with dignity, subject to safeguards, as per Common Cause (2018), the judgment was delivered by Justice J.B.Pardiwala and Justice K.V. Viswanathan.

'Due Process of Law: ensures fair and just legal proceedings. It is not mentioned in Constitution and is an American concept.

Article 21(A): Right to Education

→ Added by 86th Constitutional Amendment Act, 2002

→ It guarantees the right to free and compulsory education for children between the ages of 6 and 14.

• The Supreme Court, notably in Mohini Jain V. State of Karnataka (1992) and UnniKrishnan V. State of Andhra Pradesh (1993), expanded the scope of Article 21 to include the right to education as a fundamental right.

Article 22: Protection against Arrest & Detention in certain cases

→ A person being arrested under ordinary law has:

22(1) Gives the right to consult and be defended by a legal practitioner of one's choice.

22(2) An arrested person must be produced before the nearest magistrate within 24 hours (excluding travel time).

22(3) The protections of clauses (1) and (2) do not apply to enemy aliens and persons under preventive detention.

22(4) Preventive detention cannot exceed three months unless approved by an Advisory Board.

22(5) The grounds of detention must be communicated to the detenu and an opportunity to make a representation must be given.

22(6) Authorities may withhold facts if disclosure is against public interest.

22(7) Parliament may prescribe the circumstances and maximum period of preventive detention.

• Judicial custody means an accused is detained in jail under the supervision of a Magistrate, rather than in police lock-up, following a court order. It usually occurs after initial investigation or when bail is denied, placing the accused under the court's authority. Police require court permission for further interrogation.

Punitive detention: Occurs after a crime has been committed. Preventive detention: To prevent a possible future offence.

Article 23-24: Right against Exploitation

Article 23: Prohibition of trafficking in Human Beings and Forced Labour (Begar)

→ Exception: State can force people to do compulsory services, for e.g. during War.

→ Bonded Labour (Abolition) Act, 1976

→ Immoral Trafficking of Women and Children (Prevention) Act, 1956.

→ Minimum Wages Act, 1948.

Article 24: Prohibition of Employment of Children in Hazardous Places

→ No child below the age of 14 years shall be employed in factories, mines or any other hazardous occupations.

→ They can however work at safe places during non-school hours.

→ Child and Adolescent Labour (Prohibition & Regulation) Act- 1986.

Article 25-28: Right to freedom of Religion

Article 25: Freedom of Conscience and Free Profession, Practice and Propagation of Religion

25(1) Freedom of religion is subject to public order, morality and health.

25(2) The State can make laws to regulate religious practices.

Article 26: Freedom to Manage Religious Affairs

→ Every religious institution or section shall have the right to:

(a) Establish and maintain religious institutions.

(b) Manage their own religious affairs.

(c) Own and acquire movable and immovable property.

(d) Administer property in accordance with law.

→ Article 26 also guarantees collective freedom of religion.

Article 27: Freedom as to Payment of Taxes for Promotion of Any Particular Religion

→ This provision prohibits only the levy of taxes and not fee.

Article 28: Freedom from attending Religious Instruction

→ No religious instruction shall be provided in any educational institution wholly funded by the State.

Article 29-30: Cultural and Educational Rights

Article 29: Protection of Interest of Minorities

→ Any section of citizens with a distinct language, script, or culture has the right to conserve it.

Article 30: Rights of Minorities to establish and administer educational Institutions

→ The state cannot discriminate based on religion or language while providing aid.

****Article 29 is not solely specific to minorities whereas Article 30 is specifically for minorities (Religious and Linguistic). Term 'Minority' is nowhere defined in constitution.***

Article 31:

• ***Right to Property:*** The 44th CA 1978, removed the Right to Property from Fundamental Rights and placed it under Article 300A as a legal right.

31A: Added by 1st CA 1951. Protects land reform laws (e.g., abolition of zamindari) from challenge under Articles 14 and 19.

31B: Added by 1st CA 1951. Validates laws placed in the Ninth Schedule, protecting them from judicial review.

31C: Added by 25th CA 1971. Protects laws implementing Directive Principles under Articles 39(b) and 39(c) even if they violate Articles 14 and 19.

Article 32-35: Right to Constitutional Remedies

Article 32: Remedies for enforcement of rights conferred by this part

32(1) Right to approach the Supreme Court for the enforcement of Fundamental Rights.

32(2) Supreme Court's powers: The Supreme Court can issue orders, directions, or writs to enforce fundamental rights. These writs include Habeas corpus, Mandamus, Prohibition, Certiorari, and Quo-warranto.

32(3) Parliament may empower other courts to exercise the writ jurisdiction of the Supreme Court.

32(4) The right to constitutional remedies cannot be suspended, except as provided by the Constitution (e.g., during National Emergency under Articles 358 and 359).

- ***Parliament can authorise any other court other than SC & HC to issue writs***

Writ Jurisdiction SC vs HC:

Supreme Court (Article 32)	*High Court (Article 226)*
The SC cannot refuse to issue writ.	The HC can refuse to issue writ as it is not a Fundamental Right.
It can only issue writs when there is violation of Fundamental Rights only.	It can issue writs when there is violation of Fundamental Rights + Legal Rights (hence, writ jurisdiction of HC is wider).
Jurisdiction: Throughout the territory of India.	Jurisdiction: Throughout the state

Five writs issued by the Supreme Court (and High Courts) under Article 32 and Article 226 of the Indian Constitution are:

Habeas Corpus – *"to have the body of"*

It ensures individual liberty against unlawful detention.

Issued against: Public Authorities as well as Private individuals.

Cannot be issued against: Lawful detention, contempt of court, outside jurisdiction.

- ***ADM Jabalpur case is also known as Habeas Corpus case, it is related to 'Personal Liberty.'***

Mandamus – *"We command"*

- Orders a public official or authority to perform a mandatory duty they failed to do.
- ***Cannot be issued against:*** a private individual, President, Governor, or when the duty is not mandatory.

Prohibition – *"To forbid"*

- Issued by a superior court to a lower court to prevent the latter from exceeding its jurisdiction.
- ***Issued Against:*** Judicial and Quasi-Judicial authority.
- ***Cannot be issued against:*** Administrative authorities, legislative bodies, Private individuals or Bodies.

Certiorari – *"To be certified"*

- Issued by a higher court to transfer a case pending in the lower court to itself or nullifies the lower court's order if it acted beyond jurisdiction.
- ***Issued Against:*** Judicial, Quasi-Judicial authorities to quash their orders when they act without or in excess of jurisdiction.
- In 1991 SC ruled that it can be issued against Administrative bodies as well.
- ***Cannot be issued against:*** Private individuals or legislative bodies.

Quo Warranto – *"By what authority"*

- Challenges a person's right to hold a public office.
- Can be filed by any citizen and not necessarily by the aggrieved person.
- ***Issued against:*** A person holding public office.
- ***Cannot be issued against:*** Private office or a ministerial office.

- ***Dr. B. R. Ambedkar mentioned Article 32 as "Heart and Soul" of Indian Constitution.***

Article 33

→ It empowers the parliament to restrict the Fundamental Rights for the members of Armed Forces, Police and Intelligence Agencies to ensure proper discipline and duty. ***(50th amendment, 1984)***

Article 34

→ It provides for the restrictions on Fundamental Rights while Martial Law (Military Rule) is enforced in an area.

Martial Law borrowed from: UK

Article 35

→ It vests exclusive powers in parliament to make laws relating to enforcement of certain fundamental rights.

Rights that are available only to the citizens of India and not to Foreigners - Article 15, 16, 19, 29, 30

Parliament enjoys exclusive legislative power over certain Fundamental Rights under Articles 16(3), 17, 23, 32(3), 33, and 34 to ensure uniformity, security, and effective enforcement across India.

PART IV - DIRECTIVE PRINCIPLES OF STATE POLICY [Article 36-51]

Salient Features of DPSP

- DPSPs are non-justiciable, means that they are not legally enforceable by courts.
- The concept is borrowed from the *Irish Constitution*.
- They place **positive obligations** on the State to promote social and economic justice.
- Their objective is to help establish **social and economic democracy**.
- DPSPs reflect the vision of a **Welfare State** as outlined in the Constitution.
- They serve as a measure to assess laws based on their alignment with constitutional ideals.
- *Novel Features/Resemble the Instrument of Instructions as contained in GoI Act 1935: B. R. Ambedkar*
- DPSPs have **Moral and Political** sanctions.

Comments on DPSP:

- Conscience of Constitution: *Granville Austin*
- Manifesto of aims and aspirations: *K. C. Wheare*
- Cheque payable by the bank at its own convenience: *K. T. Shah*
- Moral Precepts for the authorities of state: *B. N. Rau*
- T. Krishnamachari: Described DPSPs as a "dustbin of sentiments."
- L. M. Singhvi: Called them the "life-giving provisions of the Constitution"

Article 36: Definition of State.

→ Defines the term "State" as it is used in Part IV.

→ The meaning of "State" here is the same as in Article 12 under Fundamental Rights (Part III).

Article 37: Application of the Principles contained in this part.

→ They are non-justiciable in nature.

→ They are fundamental to governance.

→ It is the duty of the state to apply these principles when making laws and policies

Article 38: State to secure a social order for the promotion of welfare of the people

(a) The State must promote people's welfare by ensuring justice — social, economic, and political.

(b) It should also reduce inequalities in income, status, facilities, and opportunities. (44th Amendment, 1978)

Article 39: Certain principles of policy to be followed by the State

TRICK: LDC goes to PHC

The State should work to ensure:

L- (a) **Livelihood** for all citizens

D- (b) Fair **distribution** of resources for the common good.

C- (c) Avoiding **concentration of wealth** and production.

P- (d) Equal **pay** for equal work for men and women.

H- (e) Protection of worker's **Health** and children from exploitation.

C- (f) Proper development opportunities for **Children (42nd Amendment, 1976).**

Article 39A: Equal Justice and Free Legal Aid

→ Directs the State to ensure equal Justice and provide free legal aid to the poor and weaker sections (42nd CA,1976).

Article 40: Establish Village Panchayats for Self Government.

Article 41: Right to Work, Education, and Public Assistance in certain cases

Article 42: Just and Humane Working Conditions & Maternity Relief. In K. Umadevi v. Government of Tamil Nadu (2022), the Supreme Court granted maternity benefits for the third child under the Maternity Benefit (Amendment) Act, 2017.

Article 43: Living Wages and Decent Working Conditions

Article 43A: Workers' Participation in Management of Industries

→ The State shall ensure workers' participation in industry management *(42nd Amendment, 1976).*

Article 43B: Promotion of Cooperative Societies

→ The State shall promote the formation and democratic management of cooperative societies (97th Amendment, 2011).

Article 44: Uniform Civil Code

Article 45: Provision for Early Childhood Care and Education

→ *86th Amendment Act, 2002* changed the subject matter of this article and shifted focus to early childhood care and education for children below the age of six years.

Article 46: Promotion of Educational and Economic Interests of SCs, STs, and Weaker Sections

Article 47: To prohibit the consumption of intoxicating drinks and drugs which are injurious to health.

Article 48: Organisation of Agriculture and Animal Husbandry

→ prohibit slaughter of cows, calves, and useful cattle.

Article 48A: Protection of Environment, Forests, and Wildlife

→ The State shall protect and improve the environment and safeguard forests and wildlife *(42nd Amendment, 1976).*

Article 49: Protection of Monuments and National Heritage

Article 50: Separation of Judiciary from Executive

Article 51: Promotion of International Peace and Security

51(1): Settlement of international disputes by arbitration.

Classification of DPSPs: DPSPs Classified into three Principles

- ***Socialistic principles:*** Aim for social and economic welfare, focusing on equality and a welfare state.
- ***Gandhian principles:*** Emphasize on decentralized governance, self-sufficiency, and equitable resource distribution.
- ***Liberal-Intellectual principles:*** Prioritize individual freedoms and rights, along with promoting a strong, rational state.

Socialist	*Gandhian*	*Liberal*
Article 38, 39, 41, 42, 43, 43A, 47	Article 40, 43, 46, 47, 48	Article 44, 45, 48A, 49, 50, 51

***This classification of DPSP into Socialist, Gandhian and Liberal is not mentioned in the constitution.**

DPSPs added through Amendment

- ***42nd CA (1976)***
  - 39(f): **Childrens'** healthy development
  - 39A: Equal Justice & free legal aid to **poor**
  - 43A: Participation of **workers** in management of industries
  - 48A: To protect **environment**, safeguard wildlife
- ***44th CA (1978):*** Article 38; To reduce inequality
- ***86th CA (2002):*** Article 45; Early childhood care
- ***97th CA (2011):*** Article 43B; Cooperative Societies

Cases related to DPSPs vs Fundamental Rights (FRs)

Champakam Dorairajan Case (1951): Supreme Court ruled that—

- FRs would prevail over DPSP.
- FRs are amendable.

Golaknath Case (1967): Parliament cannot revoke/amend FRs.

Aftermath of The Golaknath case:

- In response to the Golaknath case, the Parliament enacted 24th amendment which empowered Parliament to amend FRs.
- **25th Amendment:** Inserted Article 31(C)

(i) Laws implementing DPSP under Articles 39(b) and 39(c) cannot be challenged on the grounds of contravention of Article 14 & 19.

(ii) No such law can be questioned in the court.

Keshavananda Bharti Case (1973): A 13 judges bench ruled that-

- Parliament can amend FRs but cannot disturb the Basic Structure of the Constitution.
- The 2nd provision of the Article 31(C) which restricted judicial reviews of laws was declared unconstitutional.

Minerva Mill Case (1980): Indian Constitution is found on the bedrock of balance between FRs and DPSP.

Elements of the Basic structure of the Constitution

1. Separation of Power
2. Unity & Integrity of the Nation
3. Fundamental Rights
4. Judicial Review
5. Supremacy of the Constitution
6. Parliamentary System of Government

Difference between FRs and DPSPs

Fundamental Rights	*DPSPs*
Negative obligations	Positive obligations
Justiciable rights	Non-justiciable
Focused on political democracy	Promotes social/economic welfare
Protected by legal sanctions	Backed by moral/political sanctions
Oriented towards individual welfare	Focused on societal welfare
Automatically enforceable, Court can invalidate laws violating FRs.	Require legislative enactment, Courts cannot invalidate laws violating DPSP.

PART IVA- FUNDAMENTAL DUTIES [Article 51 A]

- FDs are borrowed from the ***USSR***.
- Statutory and non-enforceable / Non-justiciable
- Not originally part of the Constitution.
- Introduced through the 42nd Constitutional Amendment Act (1976)
- Applicable only to Indian citizens, not foreigners.

Committee that suggested addition of Fundamental Duties:

- ***Swaran Singh Committee*** proposed Fundamental Duties in 1976:

→ Recommended 8 duties. ***(Prime Minister - Indira Gandhi)***

→ 5 duties accepted, 3 duties rejected.

→ **Rejected duties:**
  - Imposing penalties for not observing duties.
  - Prohibition against challenging penalty laws in courts.
  - Duty to pay taxes.

- On the recommendations of ***Swaran Singh Committee*** ***the 42nd CA of 1976*** was made to ***add 10 FDs*** in Part IVA & Article 51 A.
- The 11th Fundamental Duty ***[Article 51A(k)] was added later via 86th Constitutional Amendment Act, 2002.***

ARTICLE 51(A)

(a) to abide by the Constitution and **respect** its ideals and institutions, **the National Flag and the National Anthem**;

(b) to cherish and **follow the noble ideals** that inspired the national struggle for freedom;

(c) to uphold and protect the **sovereignty, unity and integrity** of India;

(d) to **defend** the country and render national service when called upon to do so;

(e) to promote harmony and the spirit of **common brotherhood** among all the people of India, transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the **dignity of women**;

(f) to value and preserve the rich **heritage** of our composite culture;

(g) to protect and improve the natural **environment** including **forests**, lakes, rivers and wildlife, and to have compassion for living creatures;

(h) to develop the **scientific temper, humanism** and the spirit of inquiry and reform;

(i) to safeguard public property and to **abjure violence**;

(j) to **strive towards excellence** in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;

(k) duty of a parent or guardian: to provide opportunities for education to his child or ward between the age of six and fourteen years. *(Added through 86th CA, 2002)*

- *Justice Verma Committee:*

→ It identified the existence of legal provisions for implementation of Fundamental Duties and teaching school kids about their duties.

Laws Reflecting and Enforcing Fundamental Duties

- *The Unlawful Activities (Prevention) Act (1967)*

→ Prevents activities that threaten the sovereignty and integrity of India – *Duty (c)*

- *Prevention of Insults to National Honour Act (1971)*

→ Prohibits disrespect to the Constitution, National Flag, and National Anthem. – *Duty (a)*

- *Wildlife Protection Act (1972)*

→ Provides legal protection to wild animals and birds. – *Duty (g)*

- *Forest Conservation Act (1980)*

→ Restricts deforestation and conserves forests. – *Duty (g)*

- *Representation of the People Act (1951)*

→ Regulates elections and upholds democratic processes. – *Duty (a)*

- *Indian Penal Code (IPC)*

→ Defines crimes and prescribes punishments, protecting public order and morality. – *Duties (i) and (e) (to renounce derogatory practices against women)*

- *Protection of Civil Rights Act (1955)*

→Eliminates untouchability and promotes equality. –*Duty (e)*

> ***Fundamental duties are provided for Indian citizens only and not for Foreigners.***

- According to H. R. Gokhale (then Law Minister), Fundamental Duties were added in 1976 to control anti-national and unconstitutional activities that increased before the 1975 Emergency.
- The Fundamental Duties partly resemble the Universal Declaration of Human Rights (UDHR).
- The Constitution Review Commission (2002) chaired by M. N. Venkatachaliah recommended measures for effective implementation of Fundamental Duties.

> ***TRICK TO LEARN ALL FDs:***
> *a- Anthem aur flag ki respect*
> *b- Bhagat Singh/ Bapu ke ideals ko follow*
> *c- Means 3. (Sovereignty, unity, integrity)*
> *d- Defend the country*
> *e- Means 5 & E for equality, brotherhood, No derogatory practices to women's dignity*
> *f- Fort matlab heritage ki value & care karna*
> *g- Greenery- environment ka protection*
> *h- Humanism*
> *i - Eye (eye for an eye makes whole world blind), matlab Violence Nahi karna chahiye.*
> *j- Jadeja ki tarah excellent performer in all spheres bano aur achievements karo.*
> *k- K-12 (School education)*

PART V - UNION EXECUTIVE (Article 52-151)

Part V of the Constitution is divided into 5 chapters:

Chapter I: Union Executive (President + VP + PM + COMs + Attorney General) (Art 52-78)

Chapter II: Parliament (Art 79-122)

Chapter III: Legislative powers of the President (Art 123)

Chapter IV: Union Judiciary (Art 124-147)

Chapter V: Comptroller and Auditor General of India(Art 148-151)

PRESIDENT OF INDIA (Article 52-62)

Article 52: There shall be a President of India, who shall be the Head of the Union Executive

Article 53: Executive power of Union shall vest in President

- He is the Supreme Commander of all the defence forces (Army, Navy, Airforce)

Article 54: Election of President

- President is elected by an electoral college; Consisting of Elected members of both Houses of Parliament (Lok Sabha + Rajya Sabha) + Elected members of the Legislative Assemblies of the States + Elected members of the Legislative Assemblies of the UTs of Delhi and Puducherry.

Note: *Nominated members of Parliament and Members of Legislative Council do not participate in the election of the President.*

- The President is:
  - **Titular Head of the country.**
  - **First citizen of India (Ceremonial).**
  - **Nominal head / De jure head of the country.**

Article 55: Manner of election

- Indirect election (not directly by the people)
- **Proportional representation + Single Transferable Vote (STV)**
- Voting done by Secret ballot.
- Security Deposit is ₹ 15,000

Vote Value Calculations:

- President Elections— **50 proposers + 50 seconders**
- Value of vote of all MLAs = **(Total population of the state / Total number of elected MLAs) × 1/1000**
- Value of vote of an MP = **Total value of votes of all MLAs /Total number of elected MPs.**
- Electoral quota = **(Total number of valid votes polled / Vacancies +1) +1**

Article 56: Term of office of President → 5 years

Dr. Rajendra Prasad - longest serving and the 1st President of India. (1950-62)

- He can resign by addressing the resignation letter to Vice-President.

Article 57: Eligibility for Re-election of President

- Eligible for re-election any number of times.
- Naturalised citizen can become President.

USA: President can serve maximum of 2 terms.

Article 58: Qualification for election as President

Must be:

- A citizen of India.
- Minimum **35 years of age**.
- Qualified for election as a member of Lok Sabha.
- Must not hold any office of profit. (Office of profit is not defined in the Constitution)

Office of Profit: Offices in which people are appointed and removed by the government, however offices of President, Vice President, PM, Governor are not considered as office of profit.

Do you know?

- *President is immune from any criminal proceedings during his term of office.*
- *After giving 2 months notice, civil proceedings can be carried against him.*

Article 59: Conditions of office of President.

59(1) Shall not be a member of either House of Parliament or State Legislature

— If he is a member, he/she should vacate the seat before appointment.

59(2) Entitled to emoluments and allowances as maybe determined by the Parliament.

59(3) Emoluments and allowances shall not be diminished during his term.

Article 60: Oath or affirmation by the President

- In the presence of Chief Justice of India.

If unavailable → Senior-most judge of the Supreme Court

Article 61: Procedure for impeachment of the President

- Grounds of removal: violation of the Constitution. (Not defined in Constitution)
- *All Members of Parliament (elected + nominated) take part in the Impeachment process.*

Impeachment is a removal process borrowed from USA.

Impeachment procedure:

- Impeachment charges can be initiated by either house of Parliament.
- Charges should be **signed by 1/4 members of that House**.
- A **14 days notice** should be given to the President.

• After this the Resolution should be passed by **Special Majority by both the Houses** (Majority of two-thirds of the Total Membership of that House).

• President has right to appear & to be represented at such investigation.

- *Impeachment is a Quasi-judicial process.*
- *No President has been impeached till date.*
- *The nominated members of either House of Parliament can participate in the impeachment of the President though they do not participate in his/her election and the elected members of the legislative assemblies of states and the Union Territories of Delhi and Puducherry do not participate in the impeachment of the President though they participate in his/her election.*

***Article 62:** Time of holding election to fill vacancy*

• If term ends normally Election should be held before the expiration of President's term.

• If vacancy is created due to death, resignation, removal, then:

— Election must be held within 6 months, till then:

• The Vice President acts as *Acting President*.

• If Vice President is not available, then Chief Justice of India (CJI) acts as Acting President.

• If CJI is also unavailable, then Senior-most Judge of the Supreme Court acts.

E.g. When President Zakir Hussain died in May 1969, the then V.P, V.V. Giri was acting as the President. When V.V Giri resigned to contest the election of President soon after, the then CJI M. Hidayatullah worked as the officiating President from 20th July 1969 to 24th Aug 1969.

- *President has the power to declare any area as Scheduled Area - Article 244(1).*

TRICK: PrEEM TReQing pe chalna hai, so COme In Time (for Article 52 - 62)

52 → Pr	–	*President*
53 → E	–	*Executive*
54 → E	–	*Election*
55 → M	–	*Manner of Election*
56 → T	–	*Term*
57 → Re	–	*Re-election*
58 → Q	–	*Qualifications*
59 → C	–	*Conditions of office*
60 → O	–	*Oath*
61 → In	–	*Impeachment*
62 → Time	–	*Time to fill vacancy*

VICE-PRESIDENT (VP) OF INDIA [Article 63-71]

Article 63: **There shall be a Vice-President of India.**

Post of V.P. is borrowed from U.S. Constitution.

Article 64: Vice President shall be the ex-officio **Chairman** of the Council of States (Rajya Sabha).

VP holds second highest constitutional post.

VP can act as President only for a maximum period of 6 months.

Article 65: **Vice-President to act as President.**

In the Absence of the President:

• Vice President performs functions as an Acting President.

Article 66: **Election of Vice-President.**

1. **Electoral College of V.P. consists of:**

— All members (elected + nominated) of both Houses of Parliament (Lok Sabha + Rajya Sabha)

2. **Method of Election:**

— Proportional Representation + Single Transferable Vote (STV)

— 20 proposers + 20 electors as seconders

— Voting is done through Secret Ballot.

• Required Security deposit: 15,000/-

• Each voter has multiple preferences of voting.

3. **Eligibility criteria:**

- Must be a citizen of India
- Must be of 35 years of age
- Qualified for election as a member of the Rajya Sabha.

4. He shall not be a member of either house of the parliament and/or State Legislature (Same as President)

Article 67: **Term of Office of Vice-President.**

• Can hold office upto 5 years.

• Can resign to the President (and vice-versa)

e.g. Jagdeep Dhankar

67(b) Removal if:

— Resolution initiated (only in Rajya Sabha)

— 14 days prior notice required.

— Passed by effective majority in RS and simple majority in LS.

– No specific grounds is mentioned in the constitution - left to Parliament discretion.

• Will continue in office until successor takes charge.

***Article 68:** Time of holding election to fill vacancy.*

• Vacancy caused due to expiration of the term of office of VP shall be completed before the expiration of the term.

• If vacancy arises due to resignation, removal by Parliament, or death, then Election must be held as soon as possible.

Article 69: Oath or affirmation by Vice-President.

• Administered by the President or any person appointed on behalf of him.

Article 70: Discharge of President's functions in other contingencies.

Parliament may make provisions for the discharge of the President's functions in any contingency (emergency).

Article 71: Matters relating to election of President and Vice-President.

71(1) All doubts and disputes related to elections are handled by the Supreme Court, whose decision is final (Exclusive Jurisdiction).

71(2) If election is declared void by the SC, then the acts done by VP/President before the date of declaration are considered valid.

71(3) Parliament may regulate matters related to election of President / Vice President.

71(4) Election cannot be challenged on the ground that electoral college electing that person was incomplete.

Dr.Sarvepalli Radhakrishnan and M.Hamid Ansari elected for 2 consecutive terms (Served twice as Vice President).
Longest serving VP: M. Hamid Ansari (2007-2017)
He is the only VP to serve under 3 Presidents.

Article 72: Pardoning power of the President (Judiciary Power)

Types of Pardoning Power of President:

1. ***Pardon*** – Completely removes punishment and conviction.
2. ***Commutation*** – Changes the form of punishment.
3. ***Remission*** – Reduces the punishment period.
4. ***Respite*** – Lessen the punishment due to special conditions. (e.g., pregnancy)
5. ***Reprieve*** – Stay on execution for a temporary duration.

Q. What is the difference between the pardoning power of President and Governor?
Ans: The President can pardon death sentences and court-martial punishments while the Governor cannot. ***(Pardoning power of Governor is given in Article 161)***

Maru Ram v. Union of India (1980):

SC held that the pardoning power of the President under Article 72 and the Governor under Article 161 is not an absolute or personal power, but must be exercised on the aid and advice of the Council of Ministers and is subject to limited judicial review on grounds such as mala fide, arbitrariness, or extraneous considerations.

Kehar Singh vs Union of India Case (1988):

Pardoning power of the President is not subject to judicial review, unless the decision is arbitrary, mala fide, irrational, or discriminatory.

Judicial Powers of the President

• Appoints Chief Justice and judges of the Supreme Court and High Courts.

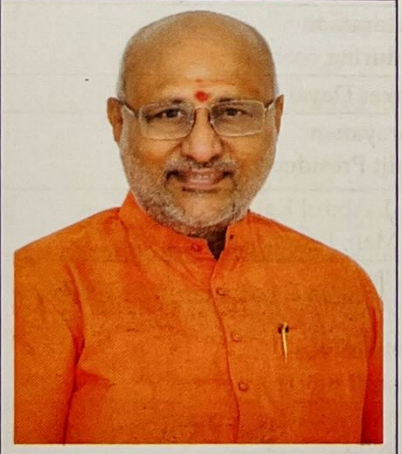
• Can seek advice from Supreme Court on any law or fact. However, the advice tendered by the SC is not binding on him.

• Exercises pardoning powers as mentioned above.

	Presidents of India	*Term*
1.	Dr. Rajendra Prasad (Longest serving President)	1950–1962
2.	Dr. Sarvepalli Radhakrishna	1962–1967
3.	Dr. Zakir Husain (First Muslim President, Died in office, Shortest Serving)	1967–1969
4.	V.V. Giri (First Acting President to be later elected)	1969–1974
5.	Fakhruddin Ali Ahmed (Died in office, Declared emergency on June 25, 1975)	1974–1977
6.	Neelam Sanjiva Reddy (Only President elected unopposed, 1st non-congress president.)	1977–1982
7.	Giani Zail Singh (First Sikh President, First to use pocket veto in 1986 on the Indian post office amendment bill. Operation blue star - 1984.)	1982–1987
8.	R. Venkataraman (Served during coalition era)	1987–1992
9.	Dr. Shankar Dayal Sharma	1992–1997
10.	K. R. Narayanan (First Dalit President)	1997–2002
11.	Dr. A. P. J. Abdul Kalam (Missile Man, People's President)	2002–2007
12.	Pratibha Patil (First woman President of India)	2007–2012
13.	Pranab Mukherjee (ex-Finance Minister)	2012–2017
14.	Ram Nath Kovind (Second Dalit President)	2017–2022
15.	Droupadi Murmu (First Tribal and Second Woman President)	2022–Present

Droupadi Murmu

	Vice Presidents of India	Term
1.	Dr. Sarvepalli Radhakrishnan (First Vice President)	1952-1962
2.	Dr. Zakir Husain (First Muslim Vice President)	1962-1967
3.	V.V. Giri	1967-1969
4.	Gopal Swarup Pathak	1969-1974
5.	B. D. Jatti	1974-1979
6.	Mohammad Hidayatullah	1979-1984
7.	R. Venkataraman	1984-1987
8.	Shankar Dayal Sharma	1987-1992
9.	K.R. Narayanan	1992-1997
10.	Krishan Kant (Died while in office)	1997-2002
11.	Bhairon Singh Shekhawat	2002-2007
12.	Mohammad Hamid Ansari	2007-2017
13.	M. Venkaiah Naidu	2017-2022
14.	Jagdeep Dhankhar	2022-2025
15.	C.P Radha Krishnan (Current Vice President)	2025-Present



C.P. Radha Krishnan

PRIME MINISTER AND COUNCIL OF MINISTERS
(Article 74-78)

Article 74: ***Council of Ministers to aid and advise President***

74(1) There shall be a Council of Ministers with the Prime Minister as the head to aid and advise the President who shall act in accordance with the advice of the Council of Ministers.

- The PM is known as the *Real/ De facto* head of the government. (President is known as *Nominal / De jure* head.)

- *The Prime Minister of India is the Chairman of the:*
  - *NITI AAYOG*
  - *Interstate Council*
  - *National Disaster Management Authority*

- **42nd Constitutional Amendment** made the advise binding on President.
- **44th Constitutional Amendment:** President may request the Council of Ministers to reconsider advice, however, after reconsideration, the President must ultimately act according to the advice tendered.

74(2) The question, whether any, and if so what advice was tendered by ministers to the President **shall not be inquired into by any court**.

Article 75: ***Other provisions as to Ministers***

75(1) The Prime Minister shall be appointed by the President and other ministers shall be appointed by the President on the advice of the Prime Minister.

91st Amendment, 2003 added 2 Subclauses under 75(1) -

75(1)(A) The total number of Ministers, including the Prime Minister; **shall not exceed 15%** of the total strength of the Lok Sabha.

75(1)(B) If any member is disqualified on the grounds of defection, they cannot become minister.

75(2) Ministers hold office till the pleasure of the President

75(3) Council of Ministers is **collectively responsible** to the House of the People (Lok Sabha).

75(4) Before entering office, the Prime Minister and Ministers must take oaths of office and secrecy administered by the President.

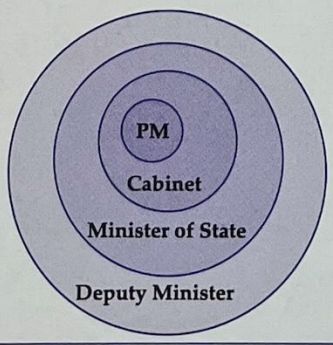
75(5) A Minister who is not a member of either Houses of the Parliament for **six consecutive months** shall cease to be a Minister at the end of that period.

75(6) Salaries and allowances of Ministers are determined by Parliament and until Parliament fixes that, it shall be as specified in the 2nd Schedule.

Types of Ministers

(not specified by the Constitution):

- *Cabinet Ministers:* Important portfolios like Defence, Home, Finance, Education, Health. Participate in Cabinet meetings.



- *Minister of State:* Handles smaller ministries (Minister of Independent charge) or assist Cabinet Ministers (Ministers attached to ministry). Do not participate in Cabinet meetings.
- *Deputy Ministers:* Assist Cabinet Ministers and Ministers of State.

Article 76: ***Attorney General of India (Highest Law Officer of the Country).***

76(1) President shall appoint a person who is qualified to be a judge of the Supreme Court to be Attorney General of India.

76(2) Duty: To give advice to the Government of India upon legal matters.

76(3) Attorney General has the right to audience in all courts within the territory of India.

76(4) Attorney General holds office till the pleasure of the President and receives remuneration as determined by the President.

POINTS TO REMEMBER:

- He is not a full-time counsel of the government.
- He is not debarred from the private legal practice, after ceasing to hold office.
- ***1st Attorney General:*** *M. C. Setalvad* ***(longest serving)***
- ***Current Attorney General:*** *R. Venkataramani*
- ***He is the highest law officer of the country.***

Solicitor General of India:

- The Solicitor General of India (second-highest law officer in the country) is appointed for a term of 3 years by the Appointments Committee of the Cabinet (ACC), which is chaired by the Prime Minister of India
- Assists Attorney General but is not a constitutional post
- ***Current Solicitor General of India:*** *Tushar Mehta*

Advocate General of State *(Article 165)*

- Appointed by Governor.
- Must be qualified to be a judge of a High Court.
- Duty: Advise State Government on legal matters.
- Holds office during the pleasure of the Governor.
- He is the highest law officer of the state.

Dissolution of Council of Ministers (CoM)

- If any member of Council of Ministers Resigns/Dies/ removed, then, a vacancy is created.
- If the Prime Minister dies or resigns then entire **CoMs is dissolved**, in that case **entire CoMs has to resign**, the President invites the leader with majority's support in the LS to become the new PM.

First Indian PM to resign - Morarji Desai

Rajya Sabha Members who became PM:

- Indira Gandhi
- Manmohan Singh
- H.D. Deve Gowda (He became the PM of India without becoming a Union Cabinet Minister)

Article 77: ***Conduct of Business of the Government of India***

77(1) All executive actions of Government of India shall be expressed to be taken in the name of the President.

77(2) Orders and instruments made in the name of the President shall be authenticated in such manner as specified in rules made by the President.

77(3) The President shall make rules for more convenient transaction of the business of Government of India and allocate responsibilities among Ministers.

Article 78: ***Duties of Prime Minister***

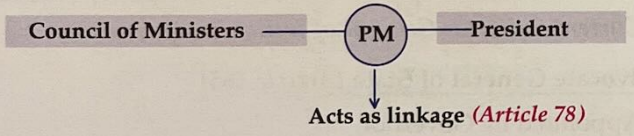
78(a) To communicate to the President all decisions of the Council of Ministers relating to administration of the Union and proposals for legislation.

78(b) To furnish such information relating to the administration of the Union and proposals for legislation as the President may call for.

78(c) If the President so requires, to submit for the consideration of the Council of Ministers any matter on which a decision has been taken by a Minister but which has not been considered by the Council.

Comments on the post of PM

- "Collective responsibility can be achieved only through the instrumentality of the Prime Minister." — *Dr. B. R. Ambedkar.*
- *Pt. J.L. Nehru* described PM as "The Linchpin of the government"; as the PM acts as a link between the Council of Ministers and the President.

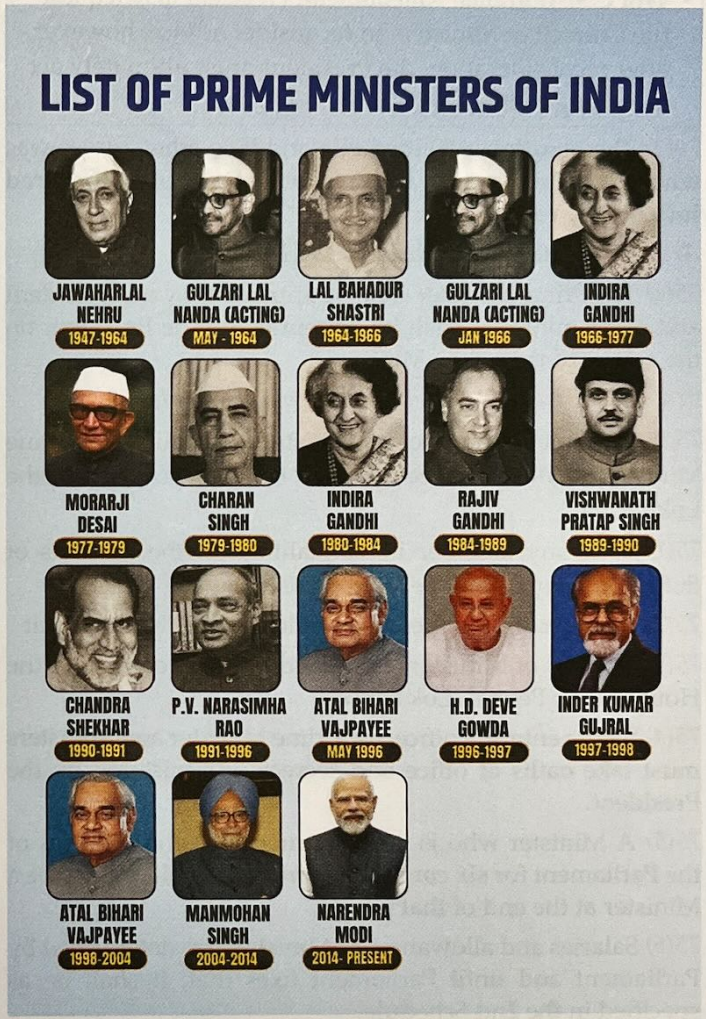


Summarising the Powers and Functions of the PM:

- Advises President regarding summoning and proroguing of the sessions of the Parliament.
- Recommends dissolution of Lok Sabha to President any time.
- Announces government policies on the floor of the House.
- Recommends names for ministerial appointments.
- Allocates and reshuffles portfolios among ministers.
- Can ask a Minister to resign or recommend dismissal.
- Presides over Council of Ministers meetings.
- Guides, directs, controls and coordinates activities of Ministers.
- Can cause collapse of the Council of Ministers by resigning.

Few PMs of India and their term of office:

- **Jawaharlal Nehru:** *Longest serving Prime Minister* (16 years, 286 days).
- Atal Bihari Vajpayee: Served an initial 13-day term as Prime Minister.
- Chaudhary Charan Singh: 170 days.
- **Chandra Shekhar:** 7 months. (Shortest serving amongst all full term PMs)
- V. P. Singh: 11 months.
- H. D. Deve Gowda: 10 months.
- Inder Kumar Gujral: 11 months.



PART V- PARLIAMENT
[Article 79-122]

Parliamentary system borrowed from UK (Westminster Model).

Article 79: Constitution of Parliament

- There shall be a Parliament of India that consists of:

— **The President** and ;

— Two Houses:

Council of States (Rajya Sabha) – Upper House

House of the People (Lok Sabha) – Lower House

Lok Sabha (LS):

- First sitting: *13 May 1952*
- Constituted on: *17 April, 1952*
- is also known as the *'House of the People'* (Hindi name adopted in 1954)
- Members elected directly by the people.

Themes of New Parliament buildings:
Lok Sabha : Peacock
Rajya Sabha : Lotus

Rajya Sabha (RS):

- **First sitting:** *13 May 1952*
- Constituted on: *3 April, 1952*
- is also known as the *'Council of States'* / *'Permanent House'* (Hindi name adopted in 1954)
- Represents States.
- Also known as the *'House of Elders'*

President is an integral part of Parliament because No Bill becomes law without his assent.

Article 80: Composition of Council of States (Rajya Sabha)

Total Members: Maximum 250
- **238 elected members**
- **12 nominated by the President:** From the fields of– **(LiSAS)** i.e. **Literature, Science, Arts, Social Service**

Present strength of RS: 245 (233 elected, 12 nominated)

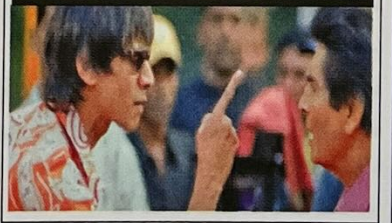
5 seats are vacant for PoK, Aksai Chin, etc.

Representation in RS:

- Members are indirectly elected by means of Proportional Representation and Single Transferable Vote (STV)

Note:

Unequal representation in RS (based on population)



President to Nominated Members

- *Election of RS members is borrowed from South Africa.*
- *Nomination of RS members is taken from Ireland*

Article 81: Composition of House of the People (Lok Sabha)

Total Members:

Maximum 550
- **530** from States
- **20** from Union Territories

Present strength: *543 elected members.*

2 Anglo Indians were nominated by President, this provision was abolished through 104 CA, 2019.

Representation in LS:

- Directly elected by citizens.
- Parity maintained among Inter and Intra States.

Q. Do you know why Lok Sabha has green carpet and Rajya Sabha has red Carpet?
Ans: Green colour represents that India is an agricultural land and people here elected from grassroots level.
Red colour represents royalty and symbolises the sacrifices done by the freedom fighters and the blood they shed to gain independence for India.

Article 82: Readjustment after Each Census

Delimitation Commission established after every Census (10 years) to:

- Divides constituencies based on population.
- President of India appoints the Delimitation Commission in consultation with the ECI.

Important Delimitation Acts:

Delimitation Commission has been setup 4 times. 1st in 1952 1962, 1972, 2002.

Key Amendments:

42nd CA (1976): Seats were frozen based on 1971 Census until 2000.

84th CA (2001): Freeze on Delimitation Commission extended till 2026.

87th CA (2003): Minor adjustments, Delimitation according to 2001 Census.

"Delimitation" means the act or process of fixing limits or boundaries of territorial constituencies.

Article 83: Duration of Houses

Rajya Sabha:

- Permanent body; *not subject to dissolution*.
- 1/3rd members retire every 2 years;
- Term of members of RS is 6 years.

Lok Sabha:

- Tenure: 5 years.
- 42nd CA (1976) - Increased tenure of Lok Sabha to 6 Years.
- 44th CA (1978) - Restored Status Quo – Ante (i.e. to 5 years)

- President authorized to dissolve Lok Sabha on the advice of PM.
- Can be extended during national emergency (one year at a time).
- Elections must be held within 6 months after the end of emergency.
- The 12th LS had the shortest span in Indian history lasting only 13 months 4 days (from 10 March 1998 to 26 April 1999).

Article 84: ***Qualifications for Membership of Parliament***

- Must be a citizen of India.
- Minimum required age: 30 years (Rajya Sabha), 25 years (Lok Sabha)
- Other qualifications as prescribed by Parliament.

Requirement for a candidate contesting election to RS from a particular state should be an elector in that particular state was dispensed with in 2003.

Article 85: ***Sessions of Parliament, Prorogation, and Dissolution on the advice of Council of Ministers.***

Parliamentary Sessions: (summoned by the President)

- ***Budget Session:*** February to April end / May first
- ***Monsoon Session:*** July-August / September
- ***Winter Session:*** November / December

Note: Maximum gap between sessions cannot exceed 6 months.

- *Prorogation:* Ends a session **(by President).**
- *Dissolution:* Formal termination of the current Lok Sabha **(by President)** on the aid & advise of CoM.
- *Adjournment:* Temporary break within a session where a sitting is terminated **(by Presiding Officer).**
- *Adjournment Sine die:* ***by Presiding Officer***

Ends the session meeting without fixing a date for next session, happens just before prorogation.

- The *adjournment motion* is introduced in the Parliament to draw the attention of the house to a definite matter of urgent public importance and needs the support of 50 members to be admitted.

Some other Parliamentary motion/Procedures:

- **Closure Motion:** A motion moved by a member to cut short the debate on a matter before the house.
- **Call Attention Motion:** It is introduced in Parliament by a member to call the attention of a minister on a matter of public importance.
- **Point of Order:** It is raised when the proceedings of the house do not follow the normal rules of procedure. No debate is allowed on Point of Order.

Censure Motion	*No-Confidence Motion*
Reason must be stated	No reason required
Can be moved against an individual, group, or entire council	Can be moved against entire council only.
To target for some specific policies/actions	To tests majority support (confidence) of LS in CoM.
If passed – no resignation required	If passed – resignation is mandatory

Types of Questions:

Starred: Oral question-answers, can have supplementary questions.

Unstarred: Required written answers, No Supplementary questions could follow.

Short Notice: 10 days prior notice should be given.

Routine of a session:
11AM: Session Starts
11 AM-12 PM: Question Hour
12-1 PM: Zero Hour

- ***Question could also be asked to*** *private members.*

(A private member is the one who is not a minister.)

- *Zero Hour:* Informal device to raise matter without any prior notice. It lasts until the agenda for the day is taken up.

Article 86: ***Right of President to Address and Send Messages***

- President can address either House or both Houses jointly.
- President can send messages regarding pending Bills or other matters.

Article 87: ***Special Address by the President***

- President addresses both the Houses in two scenarios:

→ The first session after each general election.

→ The first session of each fiscal year.

- It is also known as *Motion of Thanks*

Article 88: ***Rights of Ministers and Attorney General***

- Right to speak in either House but can vote only in that house of which they are a member.
- Attorney General is not a member of either house but has the right to speak in LS/RS, without having Right to Vote.

Officers of Parliament:

Article 89: ***Chairman and Deputy Chairman of Rajya Sabha***

- ***Chairman:*** Vice President of India (Ex-officio).

→ He is not a member of RS.

- ***Deputy Chairman:*** Elected by Rajya Sabha.
- Fulfills duties as the Acting Chairman in absence of the Chairman.

→ He is a member of RS.

- While the Chairman is presiding the house, he is like any other member of the house.

Article 90: ***Vacation, Resignation, Removal of Deputy Chairman***

- ***Resignation:*** by writing to the *Chairman.*
- Removal by Effective majority of the total membership of the Rajya Sabha.

(Effective Majority = Majority of the total membership of house - Vacancies)

Article 91: ***Power/Duty of Deputy Chairman***

- Presides in absence of Chairman.
- When Seats of Chairman and Deputy Chairman are vacant: then President can choose any member from the house to discharge duties of RS.
- If the Chairman and Deputy Chairman, both are absent, then: one member of the Panel of Vice-Chairpersons, appointed by the Chairman, presides. (This is not explicitly mentioned in Constitution).

Article 92: ***Chairman and Deputy Chairman Not to Preside During their removal***

- They can participate in proceedings but cannot preside during their own removal resolution.
- Like the speaker of the LS, the chairman of the RS does not vote in the first instance because he is not a member of the RS. He can only exercise a casting vote in case of a tie.
- However, the Deputy Chairman of the RS being a member of the house can:

→ Vote in the first instance.

→ In case of equality of votes, also exercise a casting vote when presiding.

P.T. Usha: first woman to be appointed in the RS panel of Vice-Chairpersons.

Article 93: ***Speaker and Deputy Speaker of Lok Sabha***

- Elected by Lok Sabha members by Simple Majority
- **First Speaker:** *Ganesh Vasudev Mavalankar.*
- **First Deputy Speaker:** *M.A. Ayyangar.*
- **1st Female Speaker:** *Meira Kumar (15th Speaker).*
- The Speaker of the L.S. is the ex-officio president of the Indian Parliamentary Group (IGP).
- The speaker is empowered to refer suo motu, any question of privilege for investigation.
- **Note:** No Deputy Speaker appointed since 2019.

Article 94: ***Vacation, Resignation, Removal of Speaker and Deputy Speaker***

- Resignation: *Speaker resigns to Deputy Speaker and vice-versa.*
- Removal: by *Effective majority.*
- Speaker continues till a new Speaker is elected,
- He does not immediately resign after the dissolution of LS and continue till the newly elected LS meets.

Date of election of Speaker is fixed by the President, and that of deputy speaker is fixed by speaker.

Article 95: ***Powers to Perform Duties***

Deputy Speaker presides when Speaker is absent.

- **If the Seat is vacant:** then President can choose any member to discharge the duties.
- If the speaker and Deputy speaker, both are **absent**, then : one member of the Panel of Chairpersons, appointed by the Speaker presides.

Article 96: ***Speaker and Deputy Speaker Not to Preside During Their Removal.***

They can participate but cannot preside while a motion for their removal is under discussion. (The Speaker's right to vote in the first instance is retained, but has no right to casting their vote in the case of tie.)

Note: Deputy speaker is not subordinate to the Speaker.

Article 97: ***Salaries and Allowances***

Salaries of Chairman and Deputy Chairman of Rajya Sabha and Speaker and Deputy Speaker of Lok Sabha are decided by Parliament.

Article 98: ***Secretariat of Parliament***

- Each House has its separate secretarial staff.
- Secretariat is appointed by the President on the advice of the Speaker of the LS and Chairman of RS.
- Functions of the Cabinet Secretariat:

→ To ensure interministerial co-ordination

→ Management of major crisis

→ Monitoring policy implementation

→ Organizing agendas

→ Recording minutes.

Article 99: ***Oath or Affirmations by Members***

Every member of either House must take oath before taking his seat as administered by the President or a person appointed by him.

Protem Speaker:

Senior-most member appointed temporarily by President to administer oath to newly elected members of new Lok Sabha. As soon as the oath is administered the house selects Full time Speaker. First pro-tem speaker to be unanimously elected as the speaker of the Lok Sabha- Somnath Chatterjee.

Article 100: ***Voting in Houses and Quorum***

100(1) The Chairman or Speaker shall not vote in the 1st instance but shall **exercise a casting vote** in case of a tie.

100(3) Quorum: Minimum 1/10th of total strength of House is required to carry on the proceedings.

100(4) If quorum is not met, house is adjourned by the presiding officer.

Article 101: Vacation of Seats

101(1) No person shall be a member of both Houses of Parliament.

101(2) No person can be a member of State Legislature and a member of Parliament.

101(3) Members can be disqualified as mentioned in Article 102.

101(3A) A member can resign his seat to the Chairman or Speaker.

101(4) If member of either of the Houses of Parliament is absent without permission for a period of 60 days, the house may declare the seat vacant.

> ***RPA: Representation of People Act, 1951***
> ***Jail for more than two years lead to disqualification.***

Article 102: Disqualifications for Membership

102(1) **A person shall be disqualified for membership if:**

(a) He holds any office of profit under the Union or State Government.

(b) He is of unsound mind, as declared by a competent court.

(c) He is an undischarged insolvent.

(d) He is not a citizen of India.

(e) He voluntarily acquired citizenship of another country or allegiance to a foreign State.

102(2) **Disqualification under 10th Schedule– Defection**

On the grounds of:

- Independent members join any political party.
- Nominated members join the political party after 6 months from the date of his nomination.
- If he votes contrary to the direction of his party.
- If the member voluntarily gives up the membership of the party on whose ticket he has been elected.

—***Exception:*** Merger when 2/3rd members leave and join other political party (91st CA, 2003), then there is no disqualification.

WHIP:

A whip is a direction issued by a political party to its members to vote in a particular manner in the house.

-A member is disqualified if:

- He/She votes against or abstains from the party whip
- Without prior permission and
- The act is not condoned within 15 days

Thus, the violation of whip leads to disqualification under the Anti-Defection Law.

> ***Decision of the Speaker is final with regard to disqualification under defection.***

> **Kihoto Hollohan vs Zachilhu Case:** ***Judiciary can review the final decision of the Speaker in case of disqualification under Defection.***

Article 103: Decision on Questions of Disqualification

103(1) Decision of the President shall be deemed final if question arises over disqualification of any member of the either house (other than defection).

103(2) President must obtain the opinion of the Election Commission before giving his final decision.

Article 104: Penalty for Sitting and Voting When Disqualified or before making an oath or affirmation under Article 99

- If any person sits or votes knowing they are disqualified, a penalty of Rs. 500 per day is charged for the period he/she sat or voted.

Article 105: Powers, Privileges, and Immunities of Parliament Members

105(1) Freedom of speech in Parliament.

105(2) No proceedings in Parliament can be questioned in any court of law.

No MP liable for anything said or any vote given in Parliament.

105(3) MPs enjoy protection from civil arrest during a session and 40 days before and after the session (by parliamentary convention).

- This protection does not apply to criminal arrest or preventive detention

(**Note:** Protection of the President from criminal proceedings is under Article 361, not Article 105)

Article 106: Salaries and Allowances of Members

- Parliament may by law fix salaries and allowances of members of both the Houses.

LEGISLATIVE PROCEDURES

Article 107: Introduction and Passing of Bills

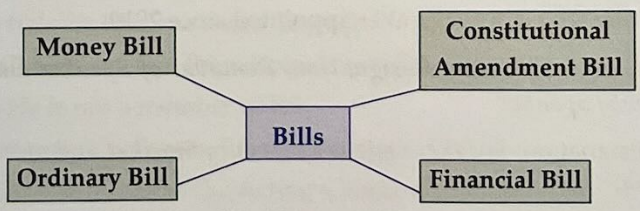
107(1) A Bill can originate in either House (LS or RS) except the Money bill.

107(2) A Bill passes if both Houses agree, with or without amendments.

107(3) Bill pending in Parliament does not lapse due to adjournment or prorogation of the session.

107(4) Bills lapsing after dissolution:

- A Bill pending in Lok Sabha and not passed at the time of its dissolution lapses.
- A Bill pending in the RS, which has not been passed by the LS shall not lapse on the dissolution of the LS.



Public Member Bill
- 1 week prior notice should be given

Private Bill (brought by a MP who is not a minister)
- 1 week prior notice should be given

Article 108: Joint Sitting of Both Houses

Provision of Joint sitting is taken from Australia.

108(1) In case of a deadlock (disagreement between both Houses), the President may summon a Joint Sitting.

- A deadlock is created if:-

(a) The bill is rejected by the other house; or

(b) The houses have finally disagreed as to the amendments to be made in the bill; or

(c) More than six months have lapsed since the date of reception of the Bill by the other House without it being passed.

108(2) Speaker of Lok Sabha presides over the Joint Sitting.

- In his absence Deputy Speaker of Lok Sabha presides.
- In absence of both, Deputy Chairman of Rajya Sabha presides (Chairman cannot preside the Joint sitting as he is not the member of either house).

Exceptions:

Money Bill and Constitutional Amendment Bill – *No Joint Sitting allowed.*

- Simple majority is needed to pass the Bill (majority of members present and voting).
- Joint Sitting follows the Rules of Lok Sabha

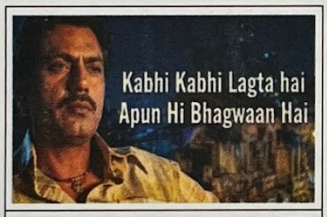
Joint Sitting has happened 3 times till now:

- Dowry Prohibition Bill, 1960
- Banking Services Commission Bill, 1977
- Prevention of Terrorism Bill, 2002

Article 109: Special Procedure for Money Bills

109(1) A Money Bill can only be introduced in Lok Sabha, on the recommendation of the President.

109(2) After a bill is passed to RS, it can: approve, suggest amendments or take no action on the bill but it must give its *response within 14 days*.



Lok Sabha in case of Money Bill

109(3) Lok Sabha may accept or reject Rajya Sabha's suggestions.

If RS does not pass the bill within 14 days – It shall be deemed passed by both Houses.

Article 110: Definition of Money Bill

A Bill is a Money Bill if it contains only provisions related to:

(a) Imposition, abolition, remission, alteration, regulation of any tax.

(b) Regulation of borrowings.

(c) Custody and audit of Consolidated Fund or Contingency Fund

(d) Appropriation of money out of Consolidated Fund.

(e) Declaring any expenditure as charged on Consolidated Fund.

(f) The receipt of money into the Consolidated Fund of India or the Public Account of India, or the custody or issue of such money.

- Though the speaker's decision on a Money Bill is final it is subject to limited Judicial review as affirmed by the SC in the Aadhaar (K.S. Puttaswamy vs Union of India case 2018).

The Speaker of Lok Sabha certifies whether a Bill is a Money Bill or not.

A Bill is not considered as a money bill if it provides:
- For the imposition of fine/imposition or abolition of any tax by local Authority

Article 111: Assent to Bills

- After a bill is passed by both the Houses the bill is then presented to the President.
- President may:

(a) Give assent – Bill becomes a law.

(b) Use its Veto power.

Veto Powers of the President (Negative Powers)

- *Absolute Veto:* President rejects the Bill completely.

→ This veto was first used by Dr. Rajendra Prasad for PEPSU Appropriation Bill 1954.

→ In 1991 R. Venkataraman exercised absolute veto over Parliamentary Salaries Bill.

- *Suspensive Veto:* President returns the Bill for reconsideration. If Parliament passes it again, assent is mandatory.

– ***Not available in case of Money bill*** because it is already brought into the Parliament after the prior recommendation of the President.

- *Pocket Veto:* No action taken by President. (No time limit to act.)

— This veto was first used by *Gyani Zail Singh for Indian Post Office (amendment) bill 1986*.

• 24th CA provided that No Veto can be used in case of a Constitutional Bill.
• Pocket of Indian President is deeper than the US president because no time limit is mentioned in constitution for Indian president to act on the bill. US President has to return in 10 days.

Article 112: Annual Financial Statement (Budget)

- President shall cause to be laid before both the Houses, a statement of estimated receipts and expenditures.

• The term 'Budget' is not mentioned in the Constitution.

- The Indian Railway Budget was separated from the General Budget in 1924 based on the *Acworth Committee* report.
- In 2017 the 92-year-old practice ended; then-Finance Minister Arun Jaitley presented the first merged Union Budget, ending separate railway budget presentations.

Article 113: Procedure in Parliament with respect to Estimates.

No expenditure from Consolidated Fund of India be done except with the authorization by Parliament.

- Estimates of Expenditure are divided into two parts:

— **Charged on the Consolidated Fund of India** (not votable due to salaries of President, SC judges, etc.)

— **Made from the Consolidated Fund of India** (subject to vote in Lok Sabha through Demands for Grants).

- Only Lok Sabha has the right to vote on Demands for Grants. RS can only discuss it.
- Demands for Grants are presented on behalf of the President.

Types of Funds in the Constitution

1. **Consolidated Fund of India (Article 266(1))**
- All revenues received by Government of India
- All loans raised
- All money received in repayment of loans
- Largest and most important fund
- No money can be withdrawn without Parliamentary approval (Appropriation Act)
- Covers: Salaries, schemes, defense, etc.

2. **Public Account of India (Article 266(2))**
- Money held by government as a banker/trustee
- Includes: Provident Fund, Small savings, Deposits, etc.
- No Parliamentary approval required for withdrawal
- Government only acts as custodian

3. **Contingency Fund of India (Article 267)**
- Fund for emergency/unforeseen expenditure
- Controlled by President of India
- Operated by Finance Secretary on behalf of President
- Requires post-facto approval of Parliament

Article 114: Appropriation Bills

- The Appropriation Bill is introduced to authorize the withdrawal of money from the Consolidated Fund of India.
- No amendments or voting on the Appropriation Bill amounts — it is passed as a formality after Demands for Grants are voted.
- ***Cut motions*** are moved during the voting on Demands for Grants to show the disapproval towards the Govt.

1. ***Policy Cut:*** Reduce the amount to ₹1, to criticize government policy.
2. ***Economy Cut:*** Reduce by a specified amount, to suggest savings.
3. ***Token Cut:*** Reduce by ₹100, to raise a specific grievance.

Article 115: Supplementary, Additional, Excess grants

- ***Supplementary grant:*** granted when the amount authorised by Parliament is found insufficient
- ***Additional grant:*** granted for additional expenditure upon some new service.
- ***Excess grant:*** It is granted when money has been spent on any service in excess of the amount granted to that service in the budget.

Article 116: Vote on Account, Votes of Credit, and Exceptional Grants

Vote on Account:

- Authorizes the government to withdraw funds from the Consolidated fund of India for essential, short-term expenditures.
- It deals solely with the expenditure side of the budget.

Vote on Credit:

- Financial grant given to the Executive from India's resources to meet urgent financial needs.
- Details cannot be shared ordinarily in a budget.
- It acts like a blank cheque given to the Executive by the Lok Sabha (LS).

Exceptional Grants:

- Special provisions made by Parliament.
- Used to meet specific expenses not covered under the regular budgetary allocation.

Stages in enactment of budget

1. Presentation
2. Discussion
3. Scrutiny by departmental committees
4. Voting on demands for grants
5. Passing of Appropriation bill
6. Passing of Finance bill

Article 117: Special Provisions for Financial Bills

- All Money Bills are Financial Bills,but vice versa is not true.
- Procedure of financial bill is same as ordinary bill, except that financial bill can be introduced only in Lok Sabha and with prior recommendation of President.

Article 118: Rules of Procedure

- Each House of Parliament may make rules for regulating its procedure and conduct of business.

Article 119: Regulation of Procedure for Financial Business

- Parliament can regulate laws related to financial procedures.

Article 120: Language to be Used in Parliament

- Business of Parliament shall be transacted in *Hindi or in English*.
- Unless Parliament by law provides, Use of 'English' to be removed after 15 years.
- ***Presiding officer may allow any member to express themselves in their mother tongue.***

Article 121: Restriction on Discussion in Parliament

- No discussions shall take place in Parliament with respect to the conduct of any judge of the Supreme Court or of a High Court.

Article 122: Court not to Inquire into Proceedings of Parliament

- No court shall inquire into Parliament proceedings.
- Conduct of MPs or officers not subject to court jurisdiction.

Article 123: Power of President to Promulgate Ordinances during Recess

President can issue ordinances when both Houses are or even one House is not in session.

- Ordinance has same force as an Act of Parliament.

(a) Must be laid before both Houses for their approval & shall cease to operate if not approved after 6 weeks from reassembly unless approved. (Hence Max life if not approved : 6 Months & 6 weeks).

(b) Can be withdrawn anytime by the President.

- ***Cooper v. Union of India Case*** (1970) - The SC held that the President's satisfaction can be questioned in a court on the grounds of malafide.
- Ordinance should not contain provisions beyond Parliament's legislative competence (i.e. on the subjects of union list.)
- ***Ordinance power of President (Centre) under Article 123;***
- ***Ordinance power of Governor (State) under Article 213.***

DC Wadhwa Case vs State of Bihar, 1986: **Relates to misuse and repeated re-promulgation of ordinances.**

Special Powers of Rajya Sabha

1. Can authorise Parliament to create a *new All India Service* (Article 312) (Currently 3 - IAS, IPS, IFoS).
2. Can *authorise the Parliament to make a law on a Subject of State List.* (Article 249)

PARLIAMENTARY COMMITTEES

- Constitution mentions these committees at different places but without any specific provision regarding their tenure, functions, etc.
- All these matters are dealt by rules of two houses.
- A Parliamentary committee is appointed by Speaker / Chairman and works on his directions.

Classification of Parliamentary Committees

Permanent Committee ↔ **Temporary Committee**

- *Standing Committee*
- *Ad Hoc Commitee*

→ **Financial Committee**

Have a tenure of 1 year:
- **Public Accounts Committee**
- **Estimates Committee**
- **Committee on Public Undertakings**

Public Accounts Committee : (PAC)

- Established in *1921* through GOI Act 1919.
- Total members: *22 members* (15 from LS + 7 from RS).
- ***Guide and Philosopher:*** CAG (submits reports which are analysed by PAC).
- **Function:** To examine the audit reports of CAG.

Estimates Committee:

- Established in *1921.*
- Re-established post Independence: 1950 on recommendation of *John Mathai Committee.*
- **Total members:** *30* (all from LS), (increased from 25 to 30 in 1956).
- **Function:** To examine estimates included in budget

Committee on Public Undertakings:

- Established in: *1964* on recommendation of *Krishna Menon Committee.*
- **Total members:** *22 Members* (15 from LS + 7 from RS) (Increased from 15 to 22 in 1974)
- Chairman is from Lok Sabha.
- **Function:** To examine reports and accounts of Public Undertakings.

Similar features of all the Financial Committees:

- Election: *Proportional representation + STV (Single transferable vote)*
- **Appointed/elected** by the House or nominated by *Speaker/Chairman.*
- **Term of members:** *1 year*
- **No Minister can be a member.** ***(Only private member)***

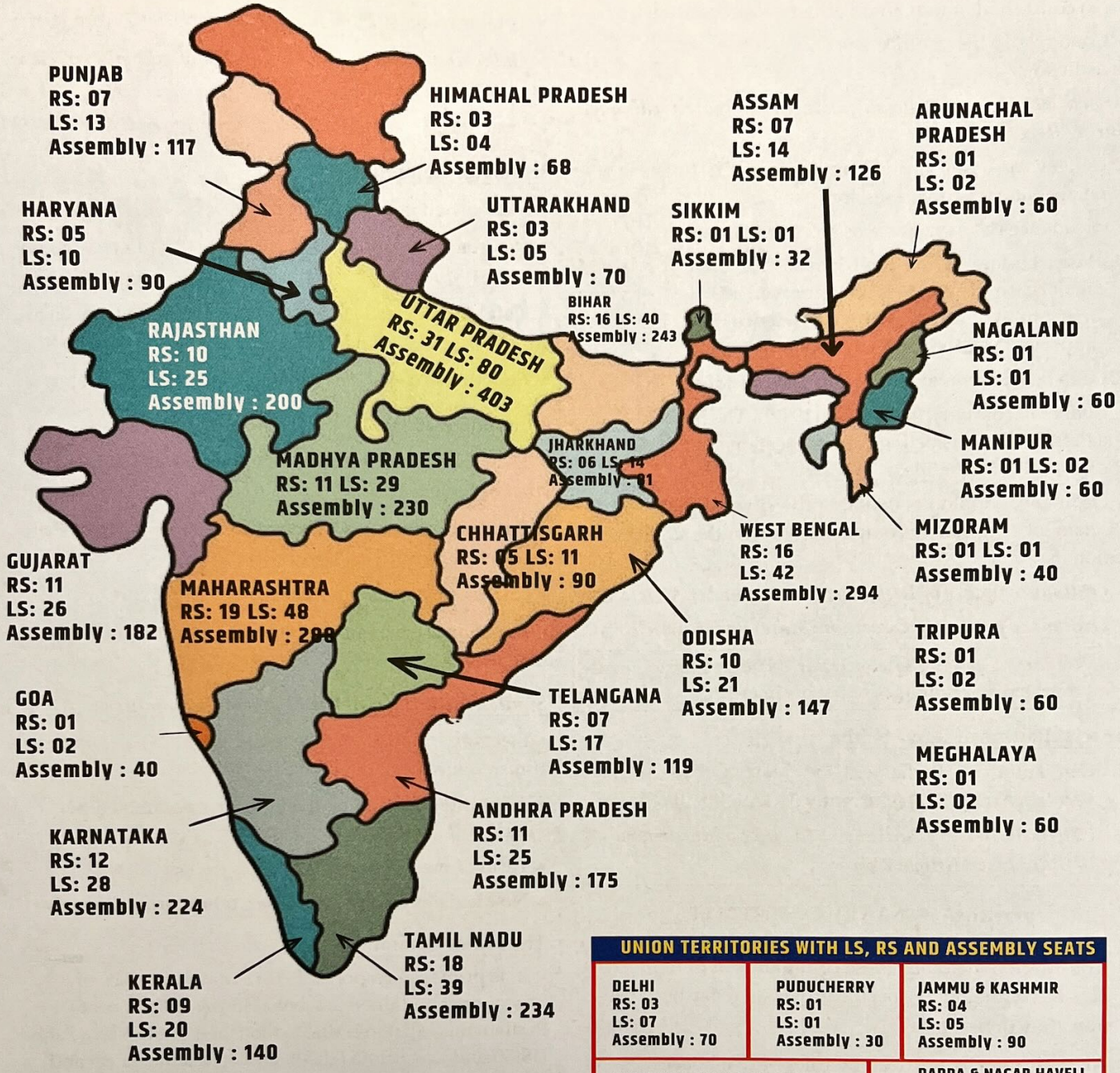
The Ethics Committee

- It is primarily responsible for examining cases of misconduct and unethical behavior by Members of Parliament (MPs) in India. Established in the Rajya Sabha (1997) and Lok Sabha (2000), it oversees the moral and ethical conduct of members.

Departmental Related Standing Committees

- Total: *24 (16 from LS + 8 from RS)*
- Strength: *31 members (21 from LS + 10from RS)*

Note:
Speaker of Lok Sabha is the Chairman of **-Business Advisory Committee, Rules Committee, General Purpose Committee,** whereas;
Deputy speaker has a special distinction where he automatically becomes **the chairman of a committee of which he is a member of.** (e.g. Committee on Private Members Bill).



UNION TERRITORIES WITH LS, RS AND ASSEMBLY SEATS

DELHI RS: 03 LS: 07 Assembly : 70	PUDUCHERRY RS: 01 LS: 01 Assembly : 30	JAMMU & KASHMIR RS: 04 LS: 05 Assembly : 90
ANDAMAN & NICOBAR ISLANDS RS: 0 LS: 01 Assembly : 0		DADRA & NAGAR HAVELI & DAMAN AND DIU RS: 0 LS: 02 Assembly : 0
CHANDIGARH RS: 0 LS: 01 Assembly : 0	LAKSHADWEEP RS: 0 LS: 01 Assembly : 0	LADAKH RS: 0 LS: 01 Assembly : 0

State-wise Distribution of Parliamentary and Assembly Seats in India

PART VI : THE STATES
[Article 152-237]

Part VI of the Constitution is divided into 6 chapter.

Chapter I: General (Definition) (Art 152)

Chapter II: The State Executive (Governor + CM + CoM + Advocate General) (Art 153-167)

Chapter III: The State Legislature (Art 168-212)

Chapter IV: Legislative Power of the Governor (Art 213)

Chapter V: The High Courts in the States (Art 214 - 231)

Chapter VI: Subordinate Courts (Art 233 - 237)

Article Mapping from Union to State level :

Articles 73-111 (Parliament) → Add 89 → gives corresponding articles of State Legislature.
Articles 112-213 → Add 90 → Gives Corresponding articles for State Legislature.

Key Replacements:

- President → Governor
- Parliament → State Legislature
- Prime Minister → Chief Minister
- Council of Ministers (Union) → Council of Ministers (State)
- Attorney General of India → Advocate General of State
- Consolidated Fund of India → Consolidated Fund of State

Chapter II: State Executive (Articles 153–167)

- Consists of *(Governor + CM + CoM + Advocate General)*

Article 153: Governor of States

- There shall be a Governor for each State.

7th Constitutional Amendment allowed for the appointment of same person as the Governor of two or more states.

Article 154: Executive Power of State

- Executive power of State vests in the Governor.
- Can be exercised directly or through subordinate officers.

Article 155: Appointment of Governor

- Governor is appointed by the President by warrant under his hand and seal.

Article 156: Term of Office of Governor

156(1) Governor holds office during the pleasure of the President.

156(2) Governor may, address his resignation to the President

156(3) Term: 5years from the date of assuming office, subject to earlier removal or resignation.

Article 157: Qualifications for Appointment as Governor

- Must be a Citizen of India and should have completed 35 years of age.

Article 158: Conditions of Governor's Office

158(1) Governor cannot be a member of Parliament or State Legislature; must vacate seat before entering office.

158(2) Governor cannot hold any office of profit.

158(3) Governor is entitled to use official residence without rent; emoluments and privileges as determined by the Parliament.

158(3A) If serving multiple states,emoluments are shared as per Presidential order.

158(4) Emoluments and allowances cannot be reduced during his tenure.

Article 159: Oath or Affirmation by Governor

- Oath administered by Chief Justice of High Court, or in absence, senior-most judge.

Article 160: Discharge of Governor's functions in contingencies

- President can appoint a person to discharge functions of Governor during contingencies.

Article 161: Power of Governor to Grant Pardons

- Governor can grant pardons, reprieves, respites, remissions, or commute sentences.
- *But he cannot:*

— Pardon death sentence (only President can).

— Use pardoning power against Martial Court sentences.

Article 162: Extent of Executive Power of State

- State's executive power extends to matters on which the State Legislature can make laws.

Article 163: Council of Ministers to Aid and Advise Governor

163(1): Council of Ministers, headed by Chief Minister, aids and advises the Governor.

Advice of Council of Ministers is not binding on the Governor and Governor can act on his discretion in certain situations.

163(2): If a question arises regarding whether a matter falls within the Governor's discretion,the Governor's decision is final and cannot be questioned.

Article 164: Other Provisions as to Ministers

164(1) Chief Minister is appointed by the Governor; other Ministers appointed on CM's advice.

164(2) Council of Ministers is collectively responsible to the Legislative Assembly of the state.

164(3) Ministers must take oaths of office and secrecy as administered by the Governor.

164(4) A Minister who is not elected as MLA/MLC within 6 consecutive months ceases to be a Minister.

164(5) Salaries and allowances determined by State Legislature.

164(6) In a hung assembly, where no single party holds a majority, the Governor uses circumstantial discretion to appoint a Chief Minister, typically selecting the leader most likely to command a majority.

Article 165: ***Advocate General for the State***

165(1) Appointed by Governor; must be qualified to be a High Court judge.

165(2) Advises State Government on legal matters.

165(3) Holds office till the Governor's pleasure.

Article 166: ***Conduct of Business of State Government***

All executive actions must be expressed in the name of Governor.

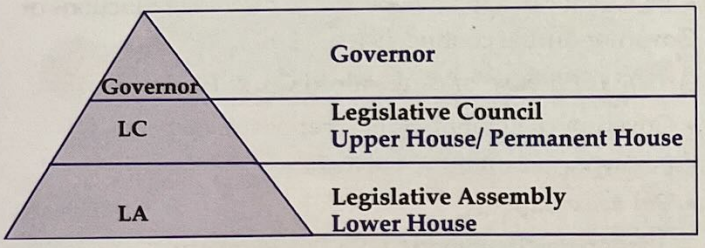
Article 167: ***Duties of Chief Minister***

Communicate decisions of Council of Ministers to Governor.

Chapter III: State Legislature (Articles 168-212)

Article 168: ***Constitution of Legislatures in States***

(1) Every State shall have a Legislature, consisting of the Governor.



- All states have a Legislative Assembly. ***(Unicameral legislature)***
- 6 States have a Legislative Council as well. ***(Bicameral legislature)***, they are:
  - *Andhra Pradesh*
  - *Bihar*
  - *Telangana*
  - *Maharashtra*
  - *Karnataka*
  - *Uttar Pradesh*

TRICK - KABUTM
K - Karnataka
A - Andhra Pradesh
B - Bihar
U - Uttar Pradesh
T - Telangana
M - Maharashtra

3 UTs out of 8 have LA, i.e. Delhi, Puducherry, J&K.

Article 169: ***Abolition or Creation of Legislative Councils***

- Parliament can **create or abolish Legislative Councils just by Simple Majority**, based on a resolution passed by the State Legislative Assembly by Special Majority.
- Such a law is not considered an amendment under Article 368.

Article 170: ***Composition of Legislative Assemblies***

170(1) Legislative Assembly: **not less than 60 and not more than 500 members** should be elected **by direct election**.

170(2) Constituencies should have roughly equal population-seat ratio.

Special case: Goa, Arunachal Pradesh, Sikkim → Minimum 30 members.
Mizoram → 40 members; Nagaland → 46 members

Article 171: ***Composition of Legislative Councils***

171(1) Total members shall **not exceed 1/3rd of Legislative Assembly, minimum 40 members**. (Indirectly Elected)

171(2) Of the total no. members of the LC of a state:

(a) 1/3rd elected by members of local authorities (municipalities, district boards, etc.).

(b) 1/12th elected by Graduates of 3 years or more.

(c) 1/12th elected by Teachers with at least 3 years experience

(d) 1/3rd elected by Legislative Assembly members.

(e) 1/6th nominated by Governor (experts in literature, science, art, social service) – Li SAS + Cooperative movement

Article 172: ***Duration of State Legislatures***

172(1) Legislative Assembly term = 5 years from first meeting, unless dissolved earlier.

172(2) Legislative Council: **Permanent body**; 1/3rd members retire every 2 years. (Hence, term of a member = 6 years)

Article 173: ***Qualifications for Membership***

(a) Must be a citizen of India.

(b) Minimum 25 years for Legislative Assembly, 30 years for Legislative Council.

(c) Must possess other qualifications prescribed by Parliament.

Article 174: ***Sessions, Prorogation, Dissolution***

174(1) Governor summons house of the Legislature;maximum gap between two sessions is 6 months.

174(2) Governor can :

(a) Prorogue Houses or

(b) Dissolve Legislative Assembly.

Article 175: ***Governor's Address and Messages***

Governor may address and send message to Legislative Assembly or Council or both houses assembled together.

Article 176: ***Special Address by the Governor***

- At the commencement of first session after each general elections and the first session of each year, Governor addresses Legislature.

Article 177: ***Rights of Ministers and Advocate General***

- Ministers and Advocate General can participate in debates and proceedings but cannot vote if they are not a member of the House.

Article 178: ***Speaker and Deputy Speaker of Legislative Assembly.***

- Legislative Assembly elects a Speaker and a Deputy Speaker.

Article 179: ***Vacation and Resignation or Removal of Speaker/ Deputy Speaker.***

- To be done by resolution passed by majority of the Assembly members.

Article 180: ***Duties of Deputy Speaker***

Deputy Speaker acts as the Speaker when office is vacant or Speaker is absent.

Article 181: ***Speaker/Deputy Speaker not to preside during consideration of resolution for their own removal.***

Article 182: ***Chairman and Deputy Chairman of Legislative Council.***

Article 183: ***Vacation, Resignation, Removal of Chairman / Deputy Chairman***

- Similar to provisions for Speaker and Deputy Speaker.

Article 184: ***Duties of Deputy Chairman***

- Deputy Chairman acts as Chairman when office is vacant or chairman is absent.

Article 185: ***Chairman or Deputy Chairman shall not preside when his removal resolution is being considered.***

Article 186: ***Salaries and Allowances*** of Speaker, Deputy Speaker, Chairman, Deputy Chairman

- Salaries and allowances are determined by State Legislature.

Article 187: ***Secretariat of State Legislature***

- Appointed and regulated by State Legislature.

Article 188: ***Oath or Affirmation by Members***

Article 189: ***Voting in Houses, Vacancies, and Quorum***

189(1) All questions in Legislature decided by majority of members present and voting.

189(2) The presiding officer does not vote in the first instance. He/she only has a casting vote in case of a tie, same rule as Parliament (Article 100).

189(3) Legislature can act despite vacancies.

189(4) Quorum for a meeting = 10% of total membership.

Article 190: ***Vacation of Seats***

Seat vacated if:

- a person is member of both the houses,
- member resigns,
- a member becomes subject to disqualification

Article 191: ***Disqualifications of Membership***

Disqualification if:

- Holds office of profit.
- Unsound mind.
- Undischarged insolvent.
- Disqualified under anti-defection laws or other Parliament-made laws.

Article 192: ***Decision on Disqualification***

Article 193: ***Penalty for Sitting and Voting before taking Oath*** or when disqualified: fine decided by Legislature.

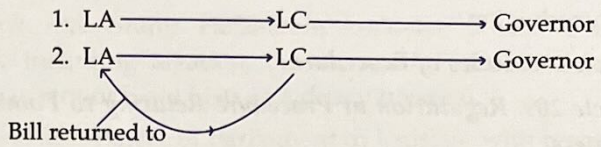
Article 194: ***Powers, Privileges, and Immunities of State Legislatures and Their Members***

Article 195: ***Salaries and Allowances of Members***

Article 196: ***Introduction and Passing of Bills***

- Bills can originate in either House (if bicameral).
- Bill must be passed by both Houses and assented by Governor to become a law.
- In case of an Ordinary bill, Legislative Assembly has upper hand over Legislative Council.
- When a bill originates in the LC, and if LA disagrees, then the bill lapses, and there is no provision for joint sitting in Part VI.

What happens when a bill originates in LA—two cases:



- **In 2nd case, LC can only delay an Ordinary Bill by maximum 4 months i.e. 3 months in first instance and for 1 month in 2nd instance.**

Article 197: ***Restriction on Powers of Legislative Council as to bills other than Money bill***

Article 198: ***Special Procedure for Money Bills***

- Money Bill can be introduced only in Legislative Assembly.
- Then sent to Legislative Council for recommendations, LC cannot reject the bill, it must return the bill within 14 days, with or without recommendations, if the council fails to do so, the money bill is deemed passed in its original form.

Article 199: ***Definition of Money Bill***

Article 200: ***Assent to Bills by the Governor***

- Under Article 200 of the Indian Constitution, the Governor has the following four options when a bill is presented:

1. Assent to the Bill: The Governor may give assent, and the bill becomes an Act.
2. Withhold Assent: The Governor may refuse assent, and the bill fails.
3. Return the Bill (if not a Money Bill): The Governor may return the bill to the State Legislature for reconsideration. If passed again, the Governor is bound to give assent.
4. Reserve the Bill for the President: The Governor may reserve the bill for consideration of the President, especially in certain cases of constitutional importance.

Article 201: ***Bills Reserved for President's Consideration***

State of Tamil Nadu vs Governor of Tamil Nadu (April 2025): The Supreme Court of India held that indefinite delay by the Governor in acting on Bills is illegal and prescribed timelines for decision-making. It also observed that the President should decide on Bills reserved under Article 201 within a period of three months.

Article 202: ***Annual Financial Statement (Budget)***

Article 203: ***Procedure in Legislature with Respect to Estimates***

• Demands for grants made only on the recommendation of the Governor.

*Article 204: **Appropriation Bills***

*Article 205: **Supplementary, Additional, and Excess Grants***

*Article 206: **Votes on Account, Votes of Credit, and Exceptional Grants.***

*Article 207: **Special Provisions for Financial Bills***

Money Bills require prior recommendation of the Governor for introduction.

*Article 208: **Rules of Procedure***

*Article 209: **Regulation of Procedure Relating to Financial Business***

*Article 210: **Language to be used in the Legislature***

*Article 211: **Restriction on Discussion in the legislature***

*Article 212: **Courts not to Inquire into Legislature Proceedings***

*Article 213: **Power of Governor to Promulgate Ordinances during Recess of the legislature***

*Article 214-231: **High Courts***

*Article 233-237: **Subordinate Courts***

Official Language - Part XVII (*Articles 343-351*)

1. Language of the Union (Art. 343–344)

Article 343: Official language of the Union - Hindi in Devanagari script

• It allowed English to continue for all official purposes for 15 years from 1950, with Parliament authorized to extend this use further

→ English continued via Official Languages Act, 1963

Article 344: Commission and Committee of parliament in official language.

→ President constitute Official Language Commission whose recommendations would be non-binding.

• The first Official Language Commission under Article 344 was headed by B. G. Kher (1955)

2. Regional Languages (Article 345–347)

Article 345: Official language of state.

• State can adopt:

→ Any regional language or Hindi

→ English continues till then

Article 346: Official language for communication between States and Union.

Hindi or English

Article 347: Special provision relating to language spoken by a section of population.

→ President can recognize language of a section of population

3. Language of Judiciary (Article 348–349)

Article 348: Language of Supreme court, High courts and Bills.

→ All Proceedings, Bills & Acts should be in English

→ Governor of a state may, with the prior consent of the President, authorize the use of Hindi or another official state language in High Court proceedings.

Article 349: Special Procedure for enactment of laws relating to language.

→ Language-related laws need: President's prior sanction (for first 15 years)

4. Special Directives (Article 350–351)

Article 350: Languages to be used in Representation for redress of Grievances.

• Any language used by Govt. is allowed

350A: Facilities for instructions in mother tongue at primary stage.

→ Added through 7th CA 1956.

→ Primary education in mother tongue (linguistic minorities)

350B: Special Officer for linguistic minorities.

• Added through 7th CA 1956

Article 351: Directives for Development of Hindi Language.

CENTRE-STATE RELATIONS

India's quasi-federal structure is characterized by a well-defined framework of Centre–State relations, designed to maintain a balance between a strong central authority and autonomous state governments.

Sarkaria Commission: 1983

- Suggested reforms to strengthen cooperative federalism.
- Strong Centre : Retained a strong Union while ensuring States' autonomy.

Article 356: To be used sparingly and only as a last resort.

- Governor's Role: Should be a neutral figure, not involved in active politics of the State.
- Inter-State Council (1990): Examined Centre–State relations and emphasized the need for better coordination between the Union and States, recommended the creation of the Inter-State Council under Article 263 of the Constitution. Based on this recommendation, the Inter-State Council was established in 1990.
- All India Services: Favoured their continuation for administrative uniformity.
- Financial Relations: Suggested fair distribution of resources and greater consultation with States.
- Concurrent list: Centre should consult States before making laws on subjects in this list.

Punchhi Commission: 2007

- Suggested reforms for better federal balance.
- Governor's Role: Fixed tenure; should act as an impartial constitutional authority.
- If bill is reserved for the President, it should be disposed of within six months to avoid unnecessary delays in the legislative process.

Rajmannar Commission: 1969 (setup by Tamil Nadu govt.)

Articles related to centre-state relations:

Centre-State Relations	
Legislative Relations	Articles 245-255
	Division of legislative powers between Parliament and State legislatures
	Procedures for passing joint legislation
Administrative Relations	Articles 256-263
	Coordination between Parliament and State legislatures in the implementation of laws and policies
Financial Relations	Articles 268-293
	Distribution of financial resources between the Centre and States
	Mechanisms for intergovernmental transfers

Legislative Relations (Part XI, Articles 245–255):

Article 245: Extent of laws made by Parliament and State Legislatures.

Article 246: Subject matter of laws (Seventh Schedule - Union, State, Concurrent Lists)

246A: Allows states to legislate on inter-state supply of goods & services.

Article 247: Power of parliament to provide for the establishment of certain additional courts.

Article 248: Grants Parliament exclusive power to make laws, including taxation, on any matter not listed in the Concurrent or State Lists (residuary powers).

Article 249: Power of Parliament to legislate with respect to matter in the state list in the national interest.

Article 250: Power of Parliament to legislate if a Proclamation of Emergency is in operation.

Article 251: If a State law conflicts with a Parliament law made under Articles 249 or 250, the Parliament law prevails and the State law becomes void to the extent of inconsistency.

Article 252: Parliament can make law on state subjects if two or more states request.

Article 253: Legislation to give effect to international agreements.

Article 254: Establishes the "doctrine of repugnancy" to resolve conflicts between central and state laws on Concurrent List subjects.

254(2): A state law repugnant to a central law can prevail in the state only if it is reserved for the President's consideration and gets his assent.

Article 255: If prior recommendation or sanction (e.g., of the President or Governor) is required for a law but not obtained, the law is not invalid if such assent is given later.

Administrative Relations (Part XI, Articles 256–263):

Article 256: Obligation of States and the Union to ensure compliance with parliamentary laws.

Article 257: Control of the Union over States in certain cases (ensuring no impediments to Union executive power, protection of railways).

Article 258: Power of the Union to confer powers on States.

Article 259: The President may entrust functions of the Union to the State Government in certain cases.

Article 260: The Government of India may, by agreement, undertake functions in territories outside India.

Article 261: Public acts, records, and judicial proceedings of the Constitution of India shall be recognized and respected throughout India.

Article 262: Adjudication of disputes relating to waters of inter-state rivers.

Article 263: Provisions with respect to an inter-state Council.

Financial Relations (Part XII, Articles 268–293):

Article 270: Taxes levied and collected by the Union and distributed between the Union and the States.

Article 271: Surcharge on certain taxes for purposes of the Union.

Other related articles:

Article 302: The Indian Parliament is empowered to impose restrictions on trade, commerce, and intercourse within India.

Inter-State Council (ISC) - 1990

It was established on the recommendation of Sarkaria Commission.

Article 263 of the Indian Constitution establishes the ***Inter-State Council (ISC)*** to address inter-State issues and foster harmonious relations between the States and the Union.

Composition of the Inter-State Council:

- Chairman: Prime Minister

Members:

- Chief Ministers of all States
- Chief Ministers of Union Territories with Legislative Assemblies
- Administrators of Union Territories without Legislative Assemblies
- Six Union Cabinet Rank Ministers nominated by the Prime Minister of India.

Zonal Councils

- Zonal Councils are the statutory (and not the constitutional) bodies.
- They are established by an Act of the Parliament ***States Reorganisation Act of 1956.***
- The act divided the country into ***five zones-***

Northern → HQ-Delhi

Southern → HQ-Chennai

Central → HQ-Allahabad/Prayagraj

Eastern → HQ-Kolkata

Western → HQ-Mumbai

and provided a zonal council for each zone.

Composition of the Zonal Council:

- Chairman: Union Home Minister
- Vice Chairman: Chief Ministers of the States included in each zone act as Vice-Chairman for that zone by rotation, each holding office for a period of one year at a time.

The North Eastern Council was constituted in 1971 by an Act of Parliament.

EMERGENCY

• Emergency Provisions are mentioned under *Part XVIII* of the Constitution in Article: 352-360

• They are borrowed from the Weimar Constitution of Germany (Suspension of FR during Emergency) + GoI Act 1935 (Emergency Provision).

• **There are three types of Emergency:**

1. National Emergency
2. State Emergency (President's rule)
3. Financial Emergency

Article 352: National Emergency

Proclamation:

• Proclamation of Emergency is made by the President after receiving a decision from **CABINET** (added through 44th CA 1978).

• Proclamation **must be approved within 1 month** from the date of its issue by both the Houses of the Parliament with a **Special Majority**.

• If approved it continues for 6 Months & **can be extended to an indefinite time period** after the approval of Parliament after every 6 Months.

• 38th CAA(1975) - There wont be any Judicial Review.

Minerva Mills Case vs Union of India, 1980:

• Proclamation of emergency is subject to *Judicial Review*.

Grounds of Proclamation:

→ War

→ External Aggression

→ Armed Rebellion: This term was inserted by the 44th Amendment, 1978. Before that it was known as ***Internal Disturbance.***

Revocation:

• Emergency can be revoked any time by the President without any requirement for Parliamentary approval.

But, if Lok Sabha passes a resolution just **by Simple Majority** approving the discontinuation of Emergency then in that case President must revoke the Emergency.

Effects of National Emergency - Article 353:

1. Effects on Centre State Relations

• ***Federal system becomes Unitary in nature***

During Non-emergency times centre can give directions to state on some specified matters but during Emergency it can give **directions on any matter**.

• During **Emergency Parliament is empowered to make laws on any subject mentioned in the state list**. (These laws become inoperative 6 months after Emergency ceases to operate.)

2. Effects on the Life of Lok Sabha and Legislative Assembly

• It may be extended for 1year at a time,but this extension cannot continue beyond a period of 6 months after the emergency has ceased to operate.

3. Effect on Fundamental Rights

Article 358	*Article 359*
It deals with suspension of FRs guaranteed by Article 19.	It deals with suspension of other FRs.
Article 19 can only be suspended on the grounds of war and external aggression and not in case of armed rebellion.	It empowers the President to suspend "Right to move any court" for enforcement of FRs except Article 20 and 21 which can never be suspended.

National Emergencies Declaration Till Now

1962: Indo-China War ***(Oct 1962-1968)***
(Then PM: J L Nehru)

1971: India and Pakistan War (Then PM: Indira Gandhi)

1975: Internal Disturbances ***(1975-1977)***
(Then PM: Indira Gandhi)
(President: Fakhruddin Ali Ahmed)

25th June: Samvidhan Hatya Diwas

Article 354: **Distribution of Revenue** - President can modify distribution of money between Centre & State during Emergency.

Article 355: **Duty of Centre to protect every state against external aggression.**

Article 355 act as the foundation for the centre to intervene in a state under Article 356 when necessary, creating a clear correlation between two provisions.

Article 356: ***President's Rule***
(State Emergency/Constitutional Emergency)

Grounds:

• If a situation has arisen in which the government of the state cannot be carried on, in accordance with the provisions of the Constitution.

• Whenever a state fails to comply with or to give effect to any direction from the centre.

Approval:

• Must be approved by both the Houses of Parliament with a simple majority **within 2 months** from the date of its issue.

• If approved it continues for 6 months and can be extended for a **maximum period of 3 years**.

Proclamation

• By the President of India which can be done only after cabinet approval. **(44th CAA, 1978)**

Revocation

- Any time by the President, no need of Parliamentary approval or
- If LS passes a resolution through ***Simple Majority***.

Consequences

- President can take up the functions of Governor.
- Parliament can take up the functions of State Legislature Executive is dismissed and Legislature is either suspended or dissolved.

There is no effect on FRs during president's rule.

Use of Article 356

- For the ***1st time*** President Rule was imposed in ***Punjab in 1951***.
- ***Manipur*** has undergone the President's Rule the most number of times (11).
- In ***Uttar Pradesh***, President Rule was imposed ***10 times***.
- Chhattisgarh and Telangana are the only Indian states that have never been placed under President's Rule.

S. R. Bommai Case (1994): Significantly curtailed the misuse of Article 356 and held that President's rule is subject to Judicial Review.

B. R. Ambedkar about Article 356: "It should be used as a last resort and as a means of final recourse."

Article 360: Financial Emergency

Proclamation:

- Article 360 empowers President to proclaim a Financial Emergency if he is satisfied that financial stability of India or any of its part has been threatened.
- It is approved by the Parliament within 2 months by a Simple Majority (same as President's Rule)
- ***No Financial Emergency has been imposed till now.***
- During the Financial Emergency, the President can ask the States to reduce the salaries and allowances of all or any class of person in government services.

PART XX- CONSTITUTIONAL AMENDMENT

Basic Pointers:

- Borrowed from the Constitution of **South Africa**.
- Article 368: Deals with the procedure of Amendment.
- Parliament cannot amend those provision which form **the Basic structure of the Constitution** (Kesavananda Bharti Case, 1973)

Basic Structure of Constitution is not Mentioned in the Constitution but was Born in Kesavananda Bharti Case (1973) & has evolved in further cases.
It consists of:
Judicial Review, Independent Judiciary, Separation of Powers, Federal Structure, Secularism, Supremacy of Constitution.

Procedure:

- Constitutional Amendment Bill can be introduced in either house of Parliament (LS/RS) but not in State Legislature.
- Can be introduced by any minister or a private member.
- It does not require the prior recommendation of President for introduction.
- President must give his/her assent & no veto is allowed in case of a Constitutional Amendment Bill under Article 368. ***(24th CA, 1971)***
- There is no provision of joint sitting in the case of a Constitutional Amendment Bill.

Types of Amendments

1. By simple majority of Parliament:

- It is outside the purview of Article 368.
- It is amended in the same way as normal legislations are passed.

2. By special majority of Parliament:

- For amending provisions, not within the first category.
- This requires both a Majority of total membership of each House and, a Majority of not less than 2/3rd of the members present and voting of each House. (As per article 368)

3. Special Majority + Ratification of atleast 1/2 of the State Legislatures:

- It is related to the federal structure of polity.
- Amendment- Special Majority of Parliament + State Ratification by Simple Majority.

Provisions Amended by Simple Majority:

- Admission/ establishment of new state
- Formation of new states, alteration of boundaries, areas, names of states.
- 2nd Schedule
- 5th/6th Schedule
- Quorum in Parliament
- Delimitation of Constituencies
- To create/abolish Legislative Council
- Use of official language
- Election to Parliament and state legislatures
- Union territories
- Salaries and allowances of members of Parliament.

Provisions Amended by Special Majority:

- Fundamental Rights
- DPSP
- Fundamental Duties

Provisions Amended by Special Majority + Ratification of at least 1/2 of the States:

- Election of President and its manner
- Supreme Court/High Court
- Article 368, itself.
- Any list in 7th Schedule

- Distribution of Legislative powers between centre and states.
- Representation of states in Parliament.

Comments on Amending Procedure:

1. ***This variety of amending process is wise, but rarely found:*** *K.C. Wheare*

2. ***Strikes a good balance between rigidity and flexibility:*** *K.C. Wheare*

3. ***The amending process has proved itself one of the most ably conceived aspects of the Constitution, Although it appears complicated, it is merely diverse:*** *Granville Austin*

Recent Constitutional Amendments (CA):

100 CA, 2015: India-Bangladesh land boundary agreement

101 CA, 2016: GST

102 CA, 2018: National Commission for Backward Classes (NCBC) ***(Gave Constitutional status)***

103 CA, 2019: Economically Weaker Section (EWS) ***(10% reservation given)***

104 CA, 2020: Removal of Anglo Indians nomination from Lok Sabha and state assemblies

105 CA, 2021: It restored the power of state government to identify the Socially and Educationally Backward Classes (SEBCs)

106 CA, 2023: 1/3rd seats in LS/LA reserved for women

(Important Amendments have been separately dealt in each chapter.)

Do you know?

- 42nd Amendment is also known as Mini Constitution due to extensive changes it brought to our constitution.
- ***K C Wheare*** said " The variety in the amending process is wise but is rarely found"

Basic Pointers:

- Judiciary in India is Integrated (borrowed from GoI act of 1935) and Independent.
- The Supreme Court replaced the Federal Court and the Judicial Committee of Privy Council after India gained Independence.
- ***1st sitting:*** *28 Jan, 1950*
- Federal Court was established in 1937 under the provisions of GoI Act 1935.
- SC is also known as *'the Guardian of the Constitution.'*

PART V - SUPREME COURT
Chapter IV: [Article 124-147]

Article 124 : ***Establishment and Constitution of Supreme Court***

124(1) Strength of Judges

- Originally, strength: *1 Chief Justice + 7 Judges* = 8 Judges
- Present, strength: *1 Chief Justice + 33 Judges* = 34 Judges

(Maximum sanctioned strength: 34)

124(2) Every judge of SC shall be appointed by the President after consultation with CJI (Collegium).

> ***The Sapru Committee (1944–45), chaired by Sir Tej Bahadur Sapru, recommended the establishment of an independent judiciary including a Supreme Court; however, the provisions relating to the appointment of judges in the Indian Constitution were not solely based on its recommendations but evolved through multiple constitutional sources and debates.***

Collegium System *(Not mentioned in Constitution)*

It is a system under which appointments and transfers of judges are decided by a forum of the CJI and the 4 senior most judges of the Supreme Court. It has no place in the Indian constitution. Its origin can be traced from the following judges cases:

First Judges Case (1982 - S.P. Gupta Case):

- Recommendation of CJI not binding on the President.
- Gave primacy to the executive in judicial appointments.

Second Judges Case (1993):

- Introduced the Collegium system, holding that *"Consultation" means Concurrence.*
- Recommendation made by CJI + 2 senior-most judges will be binding on President.

Third Judges Case (1998):

- Collegium expanded to a 5 member body,
- CJI + 4 senior-most judges, recommendation binding on the President.

> ***The Parliament replaced the collegium system by National Judicial Appointments Commission (NJAC) through 99th CA, 2014 to provide recommendations to the President.***

Fourth Judges Case (SC Advocate on record association case - 2015):

- 99th CA was declared unconstitutional and NJAC Act was struck down.
- **Collegium System was restored.**
- **Tenure:** Serves till the age of **65 years**, provided that—

(a) A Judge may resign his office by writing to the President.

(b) A Judge to be removed in the manner provided in clause (4).

124(2A) The age of a SC Judge to be determined in such manner as Parliament may by law provide. (15th CAA, 1963)

124(3) **Qualification for SC Judges:**

— (a) A Citizen of India.

— (b) At least 5 years as a Judge of a High Court, or

— (c) At least 10 years as an Advocate of a High Court, or

— (d) Distinguished jurist in the opinion of the President.

— (e) No minimum Age for Appointment is Mentioned.

124(4) **Removal (Borrowed from U.S.A):** A Judge can be removed by President after Parliament passes an address by Special Majority (i.e. majority of total membership + 2/3rd of members present and voting) **on grounds of**:

- Proved misbehaviour or Incapacity

> ***• Procedure of Removal for Supreme Court/High Court Judges is mentioned in Judges Enquiry Act, 1968***
> ***• Motion to remove judges should be signed by 50 members of Rajya Sabha or 100 members of Lok Sabha.***
> ***• Justice V. Ramaswami was the first Supreme Court judge to face impeachment proceedings, with a motion initiated against him in 1991.***

*124(5)*Parliament may by law establish procedure for investigating judge's misconduct as mentioned in clause (4).

124(6) A Judge of SC to subscribe an Oath or affirmation before the President.

124(7) Restrictions: After retirement, a SC judge cannot practice law in any court within the territory of India.

Article 125: ***Salaries, etc., of Judges***

- Salaries & allowances are determined by Parliament

Article 126: ***Appointment of Acting Chief Justice***

President appoints Acting Chief Justice when:

- Chief Justice's seat is vacant, or
- Chief Justice is unable to perform his duties.

> ***• First Female Judge of SC: Justice Fathima Beevi (1989)***
> ***• No Female Chief Justice of SC till date.***
> ***• B.V Nagarathana is expected to become the 1st woman Chief Justice of India in September 2027 on the basis of Seniority.***

Article 127: ***Appointment of Ad Hoc Judges***

- CJI, with prior consent of the President and in consultation with the Chief Justice of the concerned High

Court, may request a High Court judge (qualified for SC) to sit as an ad hoc judge (temporary judge) in the Supreme Court.

- Such ad hoc judge enjoys powers, jurisdiction, and privileges of SC judges during the time.

*Article 128: **Attendance of Retired Judges***

- Retired SC Judges can be invited to sit and act as Judge of SC.

*Article 129: **Supreme Court is a Court of Record which means:***

- Its decisions are preserved as legal precedents.
- It has power to punish for 'Contempt of court.' (Nowhere defined in Constitution)

*Article 130: **Seat of Supreme Court***

- The seat of the Supreme Court is at Delhi.
- SC can sit elsewhere if CJI recommends and President approves.

*Article 131: **Original Jurisdiction of Supreme Court***

- *SC has Exclusive Original Jurisdiction in disputes:*

— Between Government of India and one or more States.

— Between GoI and any state or states on one side and one or more states on the other side.

— Between two or more States.

> *• Article 131 (A): introduced by 42nd CA, 1976. It granted SC exclusive authority to determine the validity of central laws, it was further repealed by 43rd CA, 1977.*
> *• Further this jurisdiction of SC does not extend to following matters:*
> *→ Dispute arising out of Pre-Constitutional Treaties.*
> *→ Inter-State water Disputes.*
> *→ Matter related to Finance Commission.*

*Article 132: **Appellate Jurisdiction of SC (Constitutional Matters)***

- By way of appeal from HC to the SC of India in Constitutional matters.

*Article 133: **Appellate Jurisdiction of SC (Civil Matters)***

- Appeal to SC from HC on judgments in civil cases like: Property, Marriage, Divorce, etc.

*Article 134: **Appellate Jurisdiction (Criminal Matters)***

*Article 135: **Federal Court's Powers***

- SC can exercise powers of the Federal Court under pre-Constitution laws.

*Article 136: **Special Leave to Appeal***

- SC can grant Special Leave to appeal from any court/ tribunal judgment (except those related to Armed forces courts or Military Tribunals/Court-Martial.)

*Article 137: **Review of Judgments***

- SC can review its own judgments or orders.

Justice Syed Shah Mohammed Quadri classified Judicial Review into the following three categories:

1. Judicial review of constitutional amendments
2. Judicial review of legislation of the Parliament and State Legislatures and subordinate legislations
3. Judicial review of administrative action of the Union and States and authorities under the state.

> *Judicial review borrowed from the U.S. Constitution.*

*Article 138: **Enlargement of SC Jurisdiction***

- Parliament may expand SC's jurisdiction by law.

*Article 139: **Power to Issue Certain Writs***

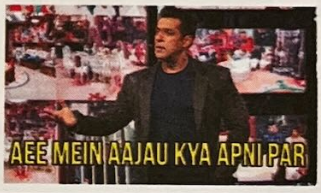
- SC can issue writs for enforcement of Fundamental Rights given under *Article 32*.
- For other purposes, it requires Parliamentary permission.

*139A **Empowers the Supreme Court to transfer cases, appeals, or proceedings from one or more High Courts to itself***

*Article 140: **Ancillary (Supportive) Powers of Supreme Court***

*Article 141: **Law Declared by SC to be binding on all Courts***

Article 141



Article 142

*Article 142: **Enforcement of Decrees and Orders***

- SC may pass any decree/ order for doing complete justice in any matter.
- Judicial Activism : Is a powerful tool that enables the SC to go beyond strict laws to ensure fairness. ***Eg.-***

1. Union carbide cooperation vs Union of India case - 1989.
2. Vishakha vs State of Rajasthan (1997) - Guidelines Dealing with sexual harassment of women at workplace.
3. Ayodhya Verdict (2019) - Land allocation for complete Justice.

*Article 143: **Advisory Jurisdiction***

- President may refer 2 kinds of matters to SC for advice.

1. Pre-constitutional matters
2. Matters of General importance

In pre-constitutional matters, SC must give its advice to President, and in both the cases, the advice is not binding on him/her.

*Article 144: **Civil and Judicial Authorities to Act in Aid of SC***

*Article 145: **Rules of Court, etc.***

• SC can make its own procedural rules with President's approval as long as it does not conflict with the laws made by the Parliament.

Article 146: Officers and Servants of the Supreme Court.

Appointments: CJI of SC appoints the Court's officers and Staff.

Service Conditions: CJI sets the rules for the staff employment and salaries.

Expenses: The SC operating cost, like staff salaries, pensions are paid from Consolidated Fund of India.

Article 147: Interpretation

Constitution clarifies that when interpreting the constitution, any significant legal question should also be considered: GOI Act, 1935, Indian Independence Act, 1947 and related orders and amendments to both of these Acts.

TRICK - SC ne SAARC countries ko SEAT OFFER Kari

SC	*Art 124*	—	*SC*
s	*Art 125*	—	*Salaries*
A	*Art 126*	—	*Acting Chief Justice*
A	*Art 127*	—	*Ad Hoc judges*
R	*Art 128*	—	*Retired judges*
C	*Art 129*	—	*Court of record*
Seat	*Art 130*	—	*Delhi as a seat*
Offer	*Art 131*	—	*Original jurisdiction*

PART VI - HIGH COURT
[Article 214-231]

Article 214: Establishment of High Courts

• Each State shall have a High Court.

• At Present - 25 High Courts.

Article 215: High Court to be Court of Record

Article 216: Constitution of High Courts

• One Chief Justice and other Judges as President may decide.

Article 217: Appointment and Conditions of Judges

217(1) **Appointment** of HC Judges is done by the President after consultation with: Chief Justice of India, Governor of State, Chief Justice of the High Court. (Collegium)

• Maximum age for HC Judge: *62 years*

• HC judge shall hand his resignation to the President.

• His Removal process is same as that of SC Judge.

217(2) **Qualifications:**

• 10 years advocate of HC, or

• 10 years holding judicial office.

217(3) **Inserted** by the 15th Amendment (1963), this provision ensures the President's decision is final and not subject to judicial review.

No provision for "Distinguished Jurist" in HC.

Article 218: Application of Certain Provisions

• Applies SC Judges' removal procedure to HC Judges, Judges Inquiry Act, 1968.

Article 219: Oath or Affirmation

• HC judge take oath before the Governor.

Article 220: Restriction on Practice After Retirement

• Former HC judges cannot practice law before any court except: SC & other HCs.

Article 221: Salaries and Allowances

• Salaries and allowances are drawn from Consolidated Fund of State while Pensions are drawn from Consolidated Fund of India.

• Salaries, allowances, leaves and pension rights are determined by the *Parliament*.

Article 222: Transfer of Judges

• President can transfer HC judges after consultation with CJI.

Article 223: Appointment of Acting Chief Justice

• The President can appoint an Acting Chief Justice when:

(a) The office of the Chief Justice of the High Court is vacant, or

(b) The Chief Justice is unable to perform duties due to absence or any other reason.

Article 224: Appointment of Additional and Acting Judges

1. **Additional Judges:** If the workload of High Court increases (e.g. due to arrears), the President may appoint additional judges for a temporary period not exceeding 2 years.

2. **Acting Judges:** If a judge is absent, unable to perform duties, or seat is vacant, the President may appoint an acting judge.

• These appointments to be done in consultation with CJI.

Article 224A: Appointment of Retired Judges at Sittings of High Courts

• The Chief Justice of a HC can request the attendance of a retired judge of that HC or any other HC.

Article 225: Jurisdiction of HC

• **Original jurisdiction** - revenue matters, election disputes of MPs and MLAs.

• **Appellate jurisdiction** - hear appeals about decisions made by lower courts.

• **Writ jurisdiction**.

Article 226: Power of HC to Issue Writs

• HC has **wider writ jurisdiction than SC**

• It can issue writs on Legal + Fundamental Rights.

• HC may **refuse** to issue writ, SC cannot.

Article 227: Superintendence over Subordinate Courts

They also manage appeals from subordinate courts and have administrative control over the district judiciary.

Article 228: Transfer of Certain Cases to HC

Article 229: Officers and Servants of HC - by Chief Justice of HC.

Article 230: Extension of Jurisdiction to Union Territories: Power of Parliament —

- Andaman & Nicobar → Calcutta HC
- Lakshadweep → Kerala HC
- Puducherry → Madras HC
- Dadra and Nagar Haveli & Daman and Diu → Maharashtra HC.
- Chandigarh → Punjab and Haryana HC

Article 231: Establishment of **Common High Court for two or more States**. *(7th CA, 1956)* for example:

a. Maharashtra and Goa have a *common HC at Mumbai*, Maharashtra.

b. Arunachal Pradesh, Nagaland, Mizoram and Assam have a *common HC at Guwahati, Assam*.

Article 232: Transfer of Cases to Federal Court (Repealed)

By the 7th Constitutional Amendment Act, 1956.

1st HC (1862): Calcutta High Court.
1st Female HC Judge: Justice Anna Chandy - Appointed to Kerala High Court.
1st Female Chief Justice of HC: Justice Leila Seth of Himachal Pradesh High Court

TRICK - NHRC AAO ReST karo (for Article 214-222)

	N - No article	**219 →**	**O - Oath**
214 →	**H - High Court**	**220 →**	**Re - Restrictions**
215 →	**R - Court of Record**	**221 →**	**S - Salary**
216 →	**C - Constitution**	**222 →**	**T - Transfer**
217 →	**A - Appointment**		
218 →	**A - Application of certain provisions**		

SUBORDINATE COURTS

Article 233: Appointment of District Judges

233(1): District Judge to be appointed by the Governor in consultation with the High Court.

233(2): A person not already in the service of the Union or of the State shall only be eligible to be appointed a district judge if he has been for not less than *seven years* an advocate or a pleader and is recommended by the High Court for appointment.

→ Judicial Review is done by High Court.

233(3): A District Judge in India holds the highest judicial authority in a district, exercising both original and appellate civil jurisdiction.

Article 233A: The 20th Constitutional Amendment Act, 1966 inserted Article 233A in the Constitution of India to **validate irregular appointments, postings, and promotions of district judges**, ensuring the legality of their judgments.

Article 234: Recruitment of Persons Other than District Judges to the Judicial Services shall be made by the Governor of the state.

Article 235: Control Over Subordinate Courts.

- A sentence of death (capital punishment) passed by a Sessions Judge or Additional Sessions Judge requires mandatory confirmation by the High Court under Section 366 of the Code of Criminal Procedure (CrPC), 1973.

Article 237: The Governor can extend judicial service rules to certain magistrates under Article 237 of the Constitution of India.

Article 241: Separate High Court can be created for UTs.

- Criminal appeals are heard by the Court of Session, and civil appeals by the District Court.

The Family Courts Act, 1984

- The Family Courts Act, 1984 (Act No. 66 of 1984) was enacted in India on September 14, 1984, to establish specialized Family Courts for promoting conciliation and securing speedy settlements in disputes relating to marriage and family affairs, for cities with populations over one million.
- Appeals against the orders of the Family Court lie to the High Court and must be heard by a bench of two or more judges.

Small Causes Courts

- These courts handle cases like simple money claims, small rent disputes, and contractual matters.
- The decrees and orders are generally final but subject to High Court's revision.
- Governed by the Provincial Small Cause Courts Act, 1887.

Lok Adalats

- It is one of the alternative dispute redressal mechanisms.
- Established under the Legal Services Authorities Act, 1987, to settle pending or pre-litigation disputes amicably.
- It came into force on **9th November 1995**
- Inspiration drawn from Ancient Indian Dispute Resolution.
- No court fee is required to bring a case to Lok Adalat.
- The award is final, binding, and cannot be appealed.
- Divorce and non-compoundable offenses cannot be dealt by Lok Adalats.
- The permanent Lok Adalat can handle cases up to a certain monetary limit (currently Rs. 1 cr).
- There is **no court fee and if court fee is already paid, the amount will be refunded** if the dispute is settled at Lok Adalat.
- The award by the Lok Adalat is **binding on the parties and it has the status of a decree of a civil court and it is non-appealable.**

Public Interest Litigation

- It is a legal mechanism in India, introduced in the 1980s by justices P.N. Bhagwati and V.R. Krishna Iyer.

• It relaxes the rule of locus standi.

→ **Locus Standi:** It is a Latin term meaning "the right to be heard" or "the right to approach the court."

→ Any public-spirited person can file a case even if they are not directly affected.

→ S.P. Gupta vs. Union of India (1981) – The landmark judgment marked the beginning of liberalisation of the doctrine of locus standi and laid the foundation for Public Interest Litigation (PIL) in India.

• To provide access to justice for the poor, downtrodden, and illiterate, and to ensure accountability of public authorities.

• PILs can be filed directly in the Supreme Court of India (under Article 32) or High Courts (under Article 226).

Tribunals

• *Part 'XIV A'*

• Added by 42nd CAA,1976.

• Tribunals are quasi-Judicial bodies.

• Key Constitutional Provisions (Part XIV-A)

→ *Article 323A (Administrative Tribunals):* Empowers Parliament to set up tribunals for adjudication of disputes related to recruitment and service conditions of public servants.

→ *Article 323B (Tribunals for Other Matters):* Empowers Parliament and State Legislatures to create tribunals for specific subjects, including taxation, foreign exchange, industrial / labor disputes, land reforms, elections, and rent/tenancy.

→ **In L. Chandra Kumar case (1997)** SC held that tribunals established under Articles 323A/323B are not substitutes for High Courts and are subject to their jurisdiction & hence their decisions are subject to Judicial Review

Some important facts to know:

• Before being elevated to the Supreme Court of India and subsequently appointed as the 52nd Chief Justice of India, Justice B.R. Gavai served as a Judge of the Bombay High Court.

• The Court of Munsiff (or Munsif Court), also known as the Civil Judge (Junior Division) court, is the primary judicial body in India that handles civil cases with small pecuniary stakes.

• The High Court of Delhi continued to exercise jurisdiction over the Union Territory of Himachal Pradesh until January 25, 1971.

• The concept of a Curative Petition was introduced by the Supreme Court of India in the landmark case of Rupa Ashok Hurra V. Ashok Hurra 2002. It was established as a final legal remedy to prevent gross miscarriages of justice, allowing the Court to reconsider a judgment even after a review petition is dismissed.

• The term 'Judicial Activism' was first coined by : Arthur Schlesinger Jr.

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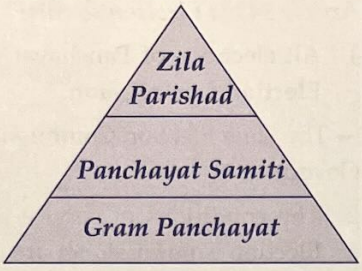
PANCHAYAT

EVOLUTION OF PANCHAYAT

Balwant Rai Mehta Committee, 1957

- Recommendation: 3-tier Panchayati Raj System

1. Gram Panchayat-Village level
2. Panchayat Samiti-Block level
3. Zila Parishad-District level



- ***Rajasthan*** - 1st state to implement Panchayati Raj at Nagaur, on 2nd October 1959 followed by Andhra Pradesh on October 11, 1959.

Ashok Mehta Committee, 1977

- Proposed: 2-tier Panchayati Raj System

1. Zila Parishad (main unit)
2. Mandal Panchayat

G.V.K Rao Committee, 1985

- Reviewed the working of Constitution in relation to the working of the Panchayats and Municipalities.
- Proposed ***Zila Parishad to act as the Nodal agency for development***.

L.M. Singhvi Committee, 1986

- 1st to recommend ***constitutional status for PRIs*** that they should constitutionally recognised, protected, and preserved.
- Advocated for financial autonomy of Panchayats.
- It also emphasised the importance of the Gram Sabha and called it the embodiment of direct democracy.
- Nyaya Panchayats should be established for a cluster of villages.

Thungon Committee, 1988

Gadgil Committee, 1988

- To examine the role of Panchayati Raj Institutions in rural development.
- Members at all three levels should be directly elected.
- Term should be fixed at 5 years.
- Reservation for SC, ST and Women

73rd Constitutional Amendment Act, 1992

- Made it mandatory to establish Panchayati Raj institutions by inserting— *Part IX, Article: 243-243O*
- ***Added Schedule 11 that contains 29 functional items.***
- Enforced on 24th April, 1993 (that's why this day is celebrated as *Panchayati Raj Day*)
- Then ***PM: P. V. Narasimha Rao.***

Articles related to Panchayat

Article 243: Definition

- "Gram Sabha" means a body consisting of persons registered in electoral rolls relating to a village comprised within the area of Panchayat at the village level.

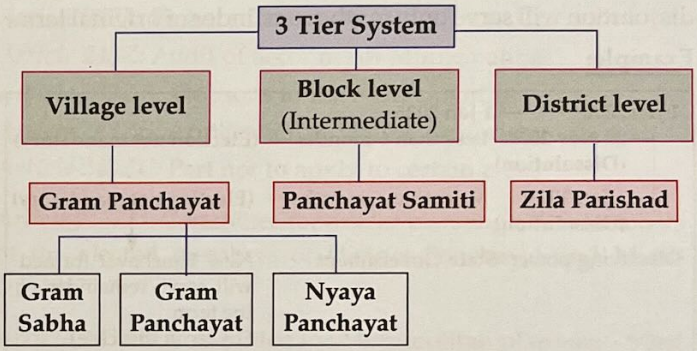
Article 243A: Gram Sabha

- A Gram Sabha may exercise such powers and perform such functions at village level as the **Legislature of State** may, by law, provide.
- It is mandatory to hold at least two meetings of the Gram Sabha every year.

Article 243B: Constitution of Panchayats

- There shall be constituted in every state, Panchayat at village, intermediate, and district level i.e.,

1. Constitution of 3-tier Panchayati Raj System
2. Panchayat at intermediate level, not to be constituted in a state having a population, **not exceeding 20 lakhs**.



Gram Nyayalayas:

- Established under Gram Nyayalayas Act 2008 (effective 2nd Oct 2009)
- It is a formal court (part of judicial system)
- Presided over by a Nyayadhikari (judicial officer)
- Has legal powers to try cases (civil + criminal)
- Aim: affordable and speedy justice in rural areas
- Criminal appeals are heard by the Court of Session and civil appeals by the District Court.

Nyaya Panchayat:

- A traditional/local village-level body.
- Established by state laws (varies from state to state)
- Deals with minor civil and petty criminal disputes
- Members are usually local people, not necessarily legally trained
- Focus: informal justice, quick settlement

Article 243C: Composition of Panchayats

1. All seats in Panchayat shall be filled by persons **chosen by direct election**.

2. The Chairperson of a Panchayat at village level shall be elected in such manner as the Legislature of a state may, by law, provide and at intermediate and district level through an **indirect election**.

Article 243D: Reservation of Seats

1. Seats are **reserved for SC/ST** in proportion of their population

2. **1/3rd seats are reserved for women.**

Article 243E: Duration of Panchayats, etc.

1. Duration of Panchayats: A **5-year term**, unless dissolved earlier by applicable laws.

2. **Election Time**

(a) Before the end of its 5 year term.

(b) Dissolution: If Panchayat is dissolved before its term ends, **election must be held within 6 months** of dissolution date. (If remaining term is less than 6 months, election is not mandatory).

3. Term of Reconstitution: Panchayat formed after early dissolution will serve only for the remainder of original term.

Example:

1 Jan 2020 ——— 1 Jan 2025
- **20 Nov 2024: Less than 6 months → (Election not mandatory) (Dissolution)**
- **1 Jan 2024: More than 6 months → (Election not mandatory) (Dissolution)**

Dissolving power: **State Government**

New Panchayat formed will serve remainder of the term.
(1 year in this case)

Article 243F: Disqualifications of Membership

1. Law made by State legislature can cause disqualification.

(a) A person convicted of a certain offense or declared insolvent may be disqualified from being a Panchayat member if they are disqualified by law related to state elections.

- He cannot be disqualified if he is less than 25 years because minimum required age is 21 years.

(b) Disqualification is decided by such authority as determined by State Legislature.

High Court deals with the election disputes of MP/MLAs

Article 243G: Power, Authority, and Responsibilities of Panchayats

- State legislature, by law, endow, the Panchayat with such powers an authority that may be necessary to enable them to function as institutions of self-government.

Article 243H: Power to Impose Taxes

- State legislature can authorise the Panchayat:-

To levy, collect and appropriate taxes, duties, tolls, and fees, grant-in-aids, ensuring proper financial management.

Article 243I: Constitution of Finance Commission by Governor to review financial position.

- Government shall lay the recommendation of Commission before the State Legislature.

Article 243J: Audit of Accounts of Panchayats

Article 243K: Election to the Panchayats

1. All elections of Panchayat shall be conducted by **State Election Commission**.

→ The State Election Commissioner is appointed by the Governor.

2. The conditions of service and tenure of office of State Election Commissioner are determined by the Governor. He can be removed from his office in the same manner as the judge of a High Court.

Article 243L: Application to Union Territories

- Provisions of Part IX, of Constitution, which deals with Panchayats, shall apply to UT's with certain modification and exceptions.

Article 243M: Part not to Apply to Certain Areas

1. Exclusion of certain areas like tribal regions and some North-Eastem states from the Panchayat system to respect their unique governance traditions, and local customs. However, provisions can be extended to these areas with necessary modification through specific laws.

The PESA Act, 1996:
The Panchayats (Extension to the Scheduled Areas) Act, 1996, extends these provisions of Part IX of the Indian Constitution, to the Scheduled Areas (Fifth Schedule Areas) of India.
- Reservation for STs: Shall not be less than half.
- All seats of chairpersons at all levels of panchayats will be reserved for STs.
- Mining permissions and recommendations must be obtained from the Gram Sabha.

2. Nothing in this part shall apply to:-

(a) Nagaland, Meghalaya, Mizoram (Panchayati Raj system do not exist here)

(b) Hill areas of Manipur (District Council exist here)

Delhi is the only UT where provisions of the Panchayats are not applicable.

Article 243N: Continuance of Existing laws and Panchayats

Article 243N ensures a smooth transition to the new Panchayati Raj System by allowing all law to remain temporarily valid, while the State makes necessary changes to comply with updated constitutional framework.

Article 243O: Bar to Interference by Courts in Electoral Matters

(a) Courts cannot interfere in the process of defining Panchayat constituencies, or assigning seats.

TRICK for Articles related to Panchayat and Municipalities:

Art 243:	*Definition*
Art 243A:	*Assembly*
Art 243B:	*Banana (Constitute karna)*
Art 243C:	*Composition*
Art 243D:	*Dalit (reservation)*
Art 243E:	*Duration 5 years (Letter E: 5)*
Art 243F:	*Fail (Disqualify)*
Art 243G:	*Goli khake power aa gyi*
Art 243H:	*House-tax*
Art 243I:	*Income (Finance)*
Art 243J:	*Jaanch (Audit)*
Art 243K:	*Kiske elections (Panchayat)*
Art 243L:	*Lieutenant Governor in UTs*
Art 243M:	*Modifications*
Art 243N:	*Continuance of existing laws and Panchayat*
Art 243O:	*Bar to interference by courts in electoral matters*

MUNICIPALITIES

- Introduced through: *74th CA, 1992*

→ *Part IXA, Art 243P-243ZG*

→ ***Added 12th Schedule that contains 18 functional items***

- ***First Municipal Corporation was set up in Madras in 1687-1688***
- 1870: Lord Mayo presented resolution of Financial Decentralisation
- Ripon's resolution of 1882 is known as ***"Magna Carta of Local Self-Government"***.
- ***Municipal Corporation in Calcutta & Bombay were set up in: 1726***

Ripon is also known as "Father of Local Self-Government"

There are 8 types of Urban Local Government

→ Municipal Corporation

→ Municipality

→ Notified Area Committee: For the administration of fast developing towns. (discontinued after 1992). Replaced by Nagar Panchayat or other Urban Local Bodies.

→ Cantonment Board (Military): Established under the Cantonments Act, 2006 and managed by the Ministry of Defence.

→ Township

→ Town Area Committee: Manages small towns with limited municipal functions like street lighting and drainage.

→ Port Trust

→ Special Purpose Agency

3 Types of Municipalities

Nagar Panchayat: For a Transitional Area

Municipal Council: For a small urban Area

Municipal Corporation: For a larger urban Area

- The municipal commissioner is responsible for implementing decisions made by municipal corporations, councils and standing committees.

All seats are filled through direct elections.
Elections conducted by: State Election Commission

Articles related to Municipalities

Article 243P: Definitions

Article 243Q: Constitution of Municipalities

Article 243R: Composition of Municipalities

Article 243S: Constitution and composition of Wards Committees, etc.

Article 243T: Reservation of seats

Article 243U: Duration of Municipalities, etc.

Article 243V: Disqualifications for membership

Article 243W: Powers, authority and responsibilities of Municipalities

Article 243X: Power to impose taxes by, and Funds of, the Municipalities

Article 243Y: Finance Commission

Article 243Z: Audit of accounts of Municipalities

Article 243ZA: Elections to the Municipalities

Article 243ZB: Application to Union territories

Article 243ZC: Part not to apply to certain areas

Article 243ZD: Committee for district planning - 4/5th members of the elected members of District Panchayat and Municipality.

Article 243ZE: Committee for Metropolitan planning - 2/3rd members are elected members of municipalities.

Article 243ZF: Continuance of existing laws and Municipalities.

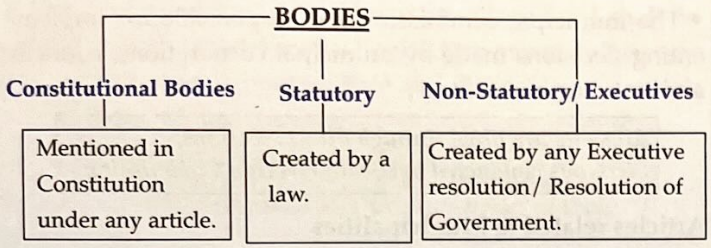
Article 243ZG: Bar to interference by courts in electoral matters.

Article 243ZH: Interpretation

Part IXB – The Co-operative Societies - (Articles 243ZH to 243ZT)

- ***Inserted by: 97th Constitutional Amendment Act, 2011.***
- Grants constitutional status and protection to co-operative societies.
- Provisions relating to the formation, regulation, and functioning of Co-operative societies.
- The audit report of an apex co-operative society is required to be laid before the State Legislature. As per Article 243ZM of the Indian Constitution and related state laws, this mandatory presentation ensures accountability and transparency for high-tier cooperatives.
- Art 243ZT: After the 97th Constitutional Amendment, a state co-operative law that is inconsistent with the amendment remains in force for 1 year.

■■■



CONSTITUTIONAL BODIES

Election Commission of India (ECI)

- Articles *324-329 (Part XV)*
- Permanent & Independent body
- Administers the election to the LS, RS, LA, LC, President, VP but not of Panchayat & Municipalities.

- *Formed on 26 Jan, 1950.*
- *Other ECs tenure-6 years or until 62 years of age.*
- *Electors photo identity cards started in 1993.*

- Composition: *Chief Election Commissioner (CEC) + 2 Election Commissioners* (as determined by the President)
- Appointment: By President.
- ***Tenure:** 6 years or until 65 years of age*
- Election Commissioner cannot be Re-appointed in same office.
- Removal: By President, Similar to the removal procedure of a Supreme Court Judge (CEC), other ECs are removed by President on the advice of CEC.
- Salary: Same as a Supreme Court Judge
- Nature of functions: Administrative, Advisory, Quasi-judicial.
- *1st CEC: Sukumar Sen*
- *Current Election Commissioner - Gyanesh Kumar (26th).*
- Originally it was a single-membered body.
- It became a Multi-membered body for the 1st time in 1989, permanently from 1st Oct 1993.
- *61st Amendment of 1988* reduced the voting age from *21 years to 18 years.*

Important Articles:

Article 324: Superintendence, direction and control of elections.

→ 19th CA, 1966, Amended article 324 of the Indian constitution to abolish the system of Election Tribunals for resolving election disputes.

Article 325: No person to be ineligible for inclusion in, or to claim to be included in a special, electoral roll on grounds of religion, race, caste or sex.

Article 326: Elections on the basis of adult suffrage, Representation of People Act.

Article 327: Powers of Parliament to make provisions with respect to elections to legislature.

Article 328: Power of Legislature of a State to make provisions with respect to elections to such legislature.

Article 329: Prohibits interference by courts in electoral matters.

Part XIV

Chapter 1 - Services (*Article 308-314*)

Article 308: Defines the term "State" for Part XIV and serves as an interpretative provision governing services under the Union and the States.

Article 309: Recruitment and conditions of service of persons serving the Union or a State.

Article 310: Tenure of office of persons serving the Union or a State.

Article 311: Dismissal, removal or reduction in rank of persons employed in Civil capacities under the Union or a State.

Article 312: All India Services.

Article 312A: Added through 28th CA, 1972, Power of parliament to vary or revoke conditions of service of officers of certain services.

Article 313: Transitional provisions.

Article 314: Provision for protection of existing officers of certain services.

Chapter II - Public Service Commission (*Articles 315- 323*)

- Independent Constitutional body; known as *"Watchdog of Merit System"*
- Composition: in discretion of the President.
- Qualification: 1/2 of members must have held Government office for 10 years.

Term: 6 years or until 65 years of age.

- Do Recruitment: All India Services and Central Services.
- Members Not Eligible for Employment other than as chairman of UPSC & SPSC once.

Removal by President if.

→ found insolvent (gone bankrupt).

→ found holding any office of profit.

→ having an infirmity of mind or body.

→ misbehaviour (as recommended by SC through an enquiry board).

Related Articles

Article 315: Public Service Commission for the Union and for the States.

Article 316: Appointment and term of office of members.

Article 317: Removal and suspension of a member of PSC.

Article 318: To make regulations as to conditions of service of members and staff of the Commission.

Article 319: Prohibition as to the holding of office by members of commission on ceasing to be such members.

Article 320: Function of PSCs.

Article 321: Power to extend functions of PSCs.

Article 322: Expenses of PSCs.

Article 323: Reports of PSCs.

State Public Service Commission (SPSC)

Articles 315-323 (Part XIV)

- Same structure as UPSC
- Term: ***6 years or until 62 years of age (same for JPSC).***
- Qualification: 1/2 of members must have held Government office for 10 years
- Recruitment: State Services
- Appointed by: Governor of the State.
- Removal: same as UPSC

Though UPSC and SPSC are constitutional bodies but Joint Public Service Commission is Statutory in nature.

Finance Commission (FC)

Article 280: Defines Finance Commission

Union Revenue Secretary acts as the ex-officio Secretary to the Council.

- A Quasi-judicial body
- Composition: Chairman + 4 Members (Constituted by President in every 5 years.
- Constitution has authorised Parliament to determine the Qualifications of member of Financial Commission.
- Finance Commission is also known as *Balancing wheel of Fiscal Federalism.*

Qualifications:

- Chairman - must be experienced in Public affairs.
- Members - a judge of HC or Qualified to be appointed as a HC judge.
- Special knowledge of finance and Accounts of government and Economics.
- Experienced in Financial Matter and Administrations.
- Members are eligible for reappointment.
- 1st FC (1951): *K C. Neogy*
- 14th FC: *Y.V. Reddy*
- 15th FC: *N.K. Singh*
- 16th FC: *Arvind Panagariya*
- Members: *Ajay Narayan Jha, Annie George Mathew, Manoj Panda, Soumya Kanti Ghosh* (Part-time)

Related Articles:

Article 281: Submission of recommendations of FC.

It makes recommendation to the President on the Net Proceeds of taxes to be shared between Centre & State. (Not binding)

GST Council

- Inserted via *101st CAA, 2016*

Article 279A:

- Composition: Joint forum of Centre & State.
- Chairperson : Union Finance Minister.
- The GST council takes decisions by a 3/4th (75%) majority of weighted votes of members present and voting. The Centre holds 1/3rd weightage, while the states together hold 2/3rd, ensuring cooperative federalism.

National Commission for SCs & STs

- SCs - *Article 338*
- STs - *Article 338A*
- Tenure - 3 Years
- Composition: Chairperson + Vice-Chairperson + 3 members
- All members appointed by President.
- Originally, Article 338 provided for a Special Officer for SCs and STs.
- Later, the *65th CAA*, 1990 replaced the Special Officer with a multimember National Commission for SCs and STs under Article 338.
- Finally, *the 89th CAA, 2003* bifurcated it into 2 separate commissions:

National Commission for Scheduled Castes (NCSC) – Article 338

National Commission for Scheduled Tribes (NCST) –Article 338A

They have Power of Civil Courts.

National Commission for Backward Classes (NCBC)

- Established in : 1993

Article: 338B:

- Originally it was a statutory body.
- Tenure - 3 Years
- Members 5 (Chairperson, Vice-Chairperson, 3 Members appointed by President).
- ***Mandal Case, 1992:*** SC directed Central government to constitute a permanent statutory body for Backward Class.

102nd Amendment Act of 2018 conferred the constitutional status and added a new article 338B to the constitution.

Comptroller and Auditor General of India (CAG)

- *Part V, Chapter V, Article 148-151*
- Head of the Indian Audit & Accounts Department
- Appointed by: President
- Term: 6 years or till 65 years of age

Current CAG - K. Sanjay Murthy

- A **Single-membered** body,
- Removal: Done in the same manner as that of SC Judge.
- Known as: ***"Guardian of Public Purse"***

- **B.R. Ambedkar** mentioned CAG as the *"Most important officer under the Constitution"*
- He acts as a ***Guide and Philosopher*** to Public Accounts Committee.
- No Reappointment.
- He compiles and maintains the accounts of State government, not central government.
- **CAG related Articles:**

Article 148: Office of Comptroller and Auditor General of India (CAG), appointment, removal, salary and other conditions of service.

Article 149: Duties and powers of CAG.

Article 150: Form of accounts of the Union and of the States.

151(1) Audit reports must be submitted to President.

151(2) Reports related to the Account of the state shall be submitted to the Governor.

Article 279: CAG ascertains and certifies the Net Proceeds of any tax and that is final.

Attorney General of India

Article 76:

- ***Highest Law Officer of India***
- Appointed by: President
- Qualification: should be eligible to become a SC Judge.
- Assisted by: Solicitor General (Not a constitutional body)

Advocate General of India

Article 165:

- Appointed by: Governor
- Qualification: must be eligible for a HC Judge
- Advices State Government in legal matters referred to him by the Governor.

STATUTORY BODIES

National Human Rights Commission (NHRC)

- Established under *Protection of Human Rights Act, 1993*

Composition:

- Chairperson (Retired CJI or SC Judge) + 5 full-time members
- Appointed by: President (based on 6-membered committee recommendation - PM, Lok Sabha Speaker, Rajya Sabha Deputy Chairman, Union Home Minister, Leader of Opposition Lok Sabha, Leader of Opposition Rajya Sabha.)
- Tenure: 3 years or 70 years of age.
- Members are eligible for re-appointment after completing their current term.
- Also known as the *"Watchdog of Human Rights"*
- Current Chairperson: *Justice V. Ramasubramanian*

State Human Rights Commission

- Established under *Protection of Human rights Act, 1993*

Composition:

- Chairperson (Retired Chief Justice or HC Judge) + 5 full-time members
- Appointed by: Governor (based on 6-membered committee recommendation - CM, State home minister, Speaker of legislative assembly, Leader of opposition of (Assembly + Council), Chairperson of the legislative council).
- Removal by: President
- Tenure: 3 years or 70 years of age.
- Members are eligible for reappointment after completing their current term but not eligible for further employment under Centre or State.

Chief Information Commission (CIC)

- Established in *2005 under Right to Information Act, 2005*
- Tenure: 5 years or 65 years of age
- Not eligible for Reappointment under Central / State Government.
- Appointment same as NHRC.
- All constitutional authorities, including the President and the Supreme Court, all NGOs that are financed by the government come under the purview of RTI Act.
- The Act mandates that the information be provided within 30 days of the request in normal cases.

Central Vigilance Commission (CVC)

- Established: *1964 by Executive Resolution*
- Initial Status: Neither constitutional nor statutory.
- ***Statutory Status granted in 2003***
- Tenure - 4 years / 65 years of age
- Recommended by: Santhanam Committee
- Appointed (on recommendation of 3 members committee - consisting of PM (as its head), Union Home Minister, Leader of opposition in L.S.)
- Removed by: President.
- 3 Membered Body.

Lokpal and Lokayuktas

- Established under *Lokpal and Lokayuktas Act, 2013*
- Status: Statutory body

Lokpal: For Centre

→ Lokpal term coined by - L.M. Singhvi in 1963.

→ Motto - Empower Citizens, Expose Corruption. This replaces the previous Motto - "Ma Gridhah Kasyasvidhanam" (Do not be greedy for anyone's wealth).

→ Equivalent to Ombudsman (Taken from Sweden).

→ Cannot take Suo-Motu action against Public Servants.

→ Preliminary Inquiries to be completed within 90 days.

→ Tenure - 5 Years / 70 years of age.

Lokayukta: For States

→ Maharashtra was the 1st State to establish the institution of Lokayukta in 1971.

→ Recommendations not binding on State Government.

→ Tenure - 5 Years / 65 years of age.

Composition:

• Chairperson (Retd. CJI or SC Judge) + Maximum 8 Members

50% Judicial members + 50% from SC, ST, OBC, minorities, and women community.

• 1st Chairperson: ***Pinaki Chandra Ghose***

• Current Chairperson: ***Ajay Manikrao Khanwilkar***

National Commission for Women

• Established on 31st January 1992 under the provisions of NCW Act, 1990.

• Current chairman - Vijaya Kishore Rahatkar (9th chairman).

University Grants Commission (UGC)

• It is a statutory body established in 1956, operating under the Ministry of Education to coordinate, determine, and maintain standards of university education, teaching, examination, and research. Headquartered in New Delhi with six regional centers.

• It provides funds to universities and advises governments on higher education improvement.

National Investigation Agency

• NIA estd. in 2008 following mumbai terror attack under the NIA act, 2008.

• Operates under the Ministry of Home Affairs.

• Headed by a Director General (DG).

• The NIA investigates Terrorism, Nuclear and atomic offences, Hijacking, Smuggling of high-quality counterfeit Indian currency etc.

• Can also investigate cases outside India if Central government directs it.

• Special Courts (Sessions Courts) are established by the Central Government for trial of NIA cases.

• Cases are tried in the Special Court where the offence was committed.

• Transfer of Cases:

Within states → High Court

Across states → Supreme Court

• Appeals against Special Court judgments lie before the High Court

EXECUTIVE BODIES

Central Bureau of Investigation (CBI)

• Established: ***1963 by Executive Resolution***

• Derive its power from Delhi Special Police Establishment Act, 1946.

• It is an ***Executive body.***

• Recommended by: Santhanam Committee

Law Commission of India

• Status: ***Executive body***

• 1st Law Commission (Pre-Independence): ***1834, headed by Lord Macaulay***

• 1st Law Commission: ***1955*** (Post-Independence)

• 1st Law Commissioner: ***M.C. Setalvad*** (Post-Independence)

• Function: Legal reform advisory

National Institution for Transforming India (NITI Aayog)

• Formed on ***1st Jan 2015 (replaced Planning Commission)***

• Status: ***Executive Body***

• Chairman: Prime Minister

• Governing Council: CMs of all States + Lt. Governors of UTs

• CEO: ***BVR Subrahmanyam***

• Vice Chairman: ***Suman K Bery***

• Provides recommendations to the Government.

• Serves as an advisory think tank to the government.

• Governing Council of NITI Aayog consists of:-

1. Chief Minister of all states and UTs.
2. Lieutenant Governors of other UTs

• Follows Bottom Up approach

• Fosters Co-operative Federalism

NITI Aayog publishes:

• SDG India Index

• National Multidimensional Poverty Index

• India Innovation Index.

NEW CRIMINAL LAWS 2023

• India replaced its colonial criminal laws with three new legislations:

1) Bharatiya Nyaya Sanhita (BNS), 2023 → Replaced IPC, 1860.
2) Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023 → Replaced CrPC, 1973.
3) Bharatiya Sakshya Adhiniyam (BSA), 2023 → Replaced Indian Evidence Act, 1872.

• All three laws came into force on 1st July 2024.

1. Bharatiya Nyaya Sanhita (BNS), 2023

• Replaced IPC, 1860.

• Contains 358 Sections (earlier 511 in IPC).

• Defines gender inclusively (male, female, transgender).

• Bharatiya Nyaya Samhita (BNS), 2023 deals with criminal substantive law, i.e., definition of offences and their punishments.

• BNS promotes digital reforms like virtual court hearings to modernize the justice system.

• Organized crime involves serious large-scale offences like terror, drug trafficking ,while petty organized crime includes small-scale group crimes like theft and snatching.

Key Changes & New Offence:

• Introduces: Mob lynching, Organised crime, Terrorism, False promise of marriage; Attempt to suicide treated differently (humanitarian approach); Community service introduced as punishment for minor offences.

• Sedition (Section 124A IPC) removed and replaced by: Section 152 – Acts endangering sovereignty, unity & integrity of India.

• Section 2 → Gender definition (inclusive)

• Other removals: Adultery, Section 377 (partially removed contextually), Obsolete offences.

• Mob lynching (death) → Death penalty or life imprisonment

• Defamation → Imprisonment + fine + community service option

• Graded punishment system introduced

→ **Important Concepts:**

• Abetment: Includes aiding, instigating, or counselling

• Child: Below 18 years

• Organised crime: Crime committed by a crime syndicate

• Focus on: National security,Victim-centric justice,Modern crimes (cyber, organised crime)

• Section 106(1): General negligent death → up to 5 years imprisonment.

• Section 106(2): Hit and run causing death → up to 10 years imprisonment + fine (if the driver flees without reporting)

2. Bharatiya Sakshya Adhiniyam (BSA), 2023

• Replaces Indian Evidence Act, 1872

• Contains 170 Sections

• Digital evidence = Primary evidence (at par)

• Governs evidence and proof in courts

• The BSA 2023 modernizes evidence law by recognizing electronic and digital records. For this, it aligns with the Information Technology Act, 2000, which already provides: Legal recognition of electronic records.

• A confession made to a police officer is inadmissible in court. Section 23 of the BSA emphasizes that only voluntary confessions free from coercion, threat or inducement are admissible as evidence in court.

• Under BSA, secondary evidence (such as photocopies or scanned documents) is admissible only when the original is lost, destroyed or otherwise unavailable for valid reasons.

Key Changes:

• Electronic evidence = Same value as paper documents

• Digital evidence treated at par with primary evidence

• Oral evidence allowed electronically

• Introduction of joint trials

• Only admissible evidence allowed

• Police confession valid only before Magistrate

Issues:

• Risk of tampering with digital evidence

• Certification rules may create contradictions

3. Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023

• Replaces CrPC, 1973

• Contains 531 Sections

• Zero FIR → Can be filed at any police station

• e-FIR allowed (within 3 days)

• Accused must be informed of grounds of arrest immediately.

• Charges framed within → 60 days (Session Court)

• Medical report (rape victim) → within 7 days

• BNSS ensures access to FIR through CCTNS (Crime and Criminal Tracking Network & Systems) portal.

• Higher courts can grant bail in general, but default bail (is granted when the investigation is not completed within the prescribed time limit usually 60 or 90 days) specifically originates at the Magistrate level.

Important Sections Of BNSS

- Section 35 → Arrest without a warrant or magistrate order.
- Section 38 → Gives arrested person right to meet an advocate during interrogation.
- Section 47 → Arrested person must be informed of grounds of arrest and right to bail.
- Section 50 → This section empowers a police officer or any person making an arrest to seize any offensive weapons found on the arrested person.
- Section 58 → No detention beyond 24 hours without Magistrate's approval.
- Section 62 → It mandates that no arrest shall be made except in accordance with the provisions of the BNSS or any other law currently in force providing for arrest.
- Section 105 → The process of search and seizures be recorded through Audio-video electronic means.
- Section 173 → Allows the registration of an electronic FIR (e-FIR).
- Section 479 → Maximum detention period (maximum period of imprisonment specified for the alleged offense under the law) for undertrial prisoners.
- Section 481 → Bail to require accused to appear before next Appellate court.
- Section 482 → Governs Anticipatory Bail (pre-arrest) or non-bailable offences.
- Section 530 → All the trials and proceedings under the sanhita may be conducted in electronic mode.

Investigation Reforms:

- Forensic investigation mandatory (≥ 7 years punishment cases)
- Videography of search & seizure compulsory
- Voice samples allowed as evidence
- Victims have Right to : Chargesheet copy, Case updates, Witness protection.
- Police custody up to 15 days (within 40–60 days window)
- Community service recognised
- Trial in absentia allowed

Overall Significance of New Laws:

1) Shift from colonial → modern justice system
2) Focus on: Digitalisation, Speedy justice, Victim rights, National security.

BNS → Defines crimes & punishments
BNSS → Defines procedure (FIR, arrest, trial)
BSA → Defines evidence & proof

Historical Background

- *Queen Elizabeth I* granted the East India Company a charter (license) on December 31, 1600.
- *The charter gave the company the exclusive right to trade with the East including India.*

THE COMPANY RULE (1773-1858)

Regulating Act 1773:

1. Governor of Bengal was converted to Governor General of Bengal.
2. *1st Governor General of Bengal: Warren Hastings*
3. Creation of executive council of 4 members to assist Governor General.
4. Bombay and Madras Presidencies made subordinate to Bengal.
5. *Establishment of Supreme Court at Calcutta (1774),* (1 Chief Justice + 3 other judges).
6. It prohibited the company servants from taking any Bribe or Presents from Indians.
7. Court of Directors (to manage commercial functions) - will report on its Revenue, Civil and Military affairs.

> ***Warren Hastings: The last Governor of Bengal + 1st Gov. General of Bengal.***
> ***Elijah Impey: 1st Chief Justice of SC (Calcutta) pre-independence.***
> ***Justice Harilal Kania: 1st Chief Justice of India post independence.***

Amending Act, 1781:

1. It was passed to rectify the defects of regulating act 1773, it is also known as the *Act of Settlement.*
2. Exempted the Governor-General and Council from the jurisdiction of Supreme Court.

Pitt's India Act, 1784 *(named after William Pitt the Younger)*

1. It created Board of Control to manage administrative affairs i.e. dual control system started from here.
2. It was called as *"Half Loaf System"* as it sought to mediate between parliament and the company directors.
3. For the first time company territories in India was called as british possessions in India.

Dual Control (Half Loaf System)

- ***Commercial functions to be managed by Court of Directors***
- ***Administrative functions to be managed by Board of Control***

Charter Act of 1793

1. It extended the trade monopoly of the company in India for another period of 20 years.
2. Commander-in-chief was not to be a member of the Gov-General council, unless he was so appointed.
3. Members of the Board of Control and staff were to be paid out of the Indian Revenue.

Charter Act of 1813

1. It formally ended the East India Company's trade monopoly over the Indian market, reflecting the shift in British economic policy towards free trade and continued the monopoly of the Company over trade in tea and trade with China.
2. It asserted the Sovereignty of the British crown over the company's territories in India.
3. It allowed *Christian Missionaries* to come to India : *To promote Christianity.*
4. Rs. 1 Lakh was allotted to be spent on Indian Education.
5. It authorised the local governments in India to impose taxes on persons and punish the persons for not doing so.

> ***1st Christian Missionary Organisation, Serampore Mission was founded by: William Carey (in 1800).***
> ***1st Christian Missionary in India: Thomas Apostle.***

Charter Act of 1833 (Also known as *"Saint Helena Act*)

1. *Governor-General of Bengal converted to Governor General of India.* ***(1st: Lord William Bentinck)***
2. Deprived the Governor of Bombay and Madras of their legislative powers.
3. It *ended activities of EIC as a commercial body,* became purely administrative body (lost monopoly trade with China).
4. It provided for the establishment of Law Commission of India to consolidate and codify Indian laws.
5. It attempted to introduce a system of open competition for selection of Civil Servants.
6. A law member to be in Govenor's Executive Council. (Thomas Babington Macaulay was appointed as its 1st Law member).
7. It completely abolished all commercial activities of the East India Company and transformed it into a purely administrative body responsible for the governance of British territories in India.

Charter Act of 1853

1. Separated legislative and administrative functions of the Governor General's Council.
2. Under it, there was an addition of 6 new members to Council as Legislative Councillors.
3. It *introduced Open Competition for Civil Services.*
4. It extended the Company rule in Indian Territory, but period was not specified.
5. Introduced, Local Representation in the Indian Legislative Council.

6. Of the 6 Legislative Members of the Governor-General's council 4 members were appointed by the local government of Madras, Bombay, Bengal and Agra.

The Crown Rule (1858-1947)

Government of India Act, 1858 (Also known as *"Queen's Proclamation"*)

1. Abolished the East India Company, and transferred the powers of Government, territories and revenues to the British Crown.
2. It changed the designation of Governor General of India to that of Viceroy of India; *Lord Canning became the 1st Viceroy of India*.
3. It **ended the system of Dual Government** by abolishing the Board of Control and Court of Directors.
4. It *created a new office of Secretary of State for India assisted by a 15-member council* with complete authority and control over Indian administration.

Peel Commission 1858 (after 1857 Revolt)
It suggested reforms and the British Government accepted the recommendations and redesigned the Indian military.

Indian Council Act, 1861

1. Associated Indians with law making process. In 1862, Viceroy Lord Canning nominated three Indians to the legislative council. (Raja of Benaras, Maharaja of Patiala and Sir Dinkar Rao.)
2. It initiated the process of *decentralisation* by restoring the legislative powers to the Bombay and Madras Presidencies.
3. It also provided for the establishment of *new legislative councils for: Bengal, North-Western Provinces and Punjab*.
4. Recognition to the *'portfolio'* system, introduced by *Lord. Canning in 1859*.
5. It empowered the Viceroy to issue ordinances, without the concurrence of the legislative council, during an emergency. The life of such an ordinance was 6 months.

Indian Councils Act, 1892

1. It introduced *indirect elections*.
2. It permitted discussions on financial matters, and allowed members to question the executive, enhancing accountability.

Indian Councils Act, 1909

• Also known as *Morley-Minto Reforms* (Lord Morley-Secretary of State and Lord Minto - Viceroy of India)

1. Increased the size of the legislative councils, both Central and Provincial. The no. of members in the central legislative council was raised from 16 to 60.
2. Members : Official majority in central legislative council and non-official majority in Provincial legislative council.
3. It provided for the association of Indians with Executive Councils of the Viceroys and Governor (*Satyendra Prasad Sinha* was the *1st* Indian to join, later appointed as the Law member)
4. It *introduced Separate Electorate for Muslims* (System of Communal Representation) i.e. Muslim members were elected by muslim voters ***(Lord Minto: Father of Communal Electorate)***
5. Members were allowed to ask supplementary questions, move resolutions on the budget and so on.
6. It also provided for the separate representation of presidency corporations, chambers of commerce, universities and zamindars.

Government of India Act, 1919

• Also known as *Montagu-Chelmsford Reforms* (Montagu-Secretary of State for India and Lord Chelmsford - Viceroy of India).

1. *Dyarchy introduced in provinces.*
2. Classified all the subjects of administration into the central subjects and the provincial subjects.

Provincial subjects were further divided into **two parts**: **Transferred and Reserved Subjects.**

Transferred subjects: (Governor-General not responsible)- Public health, Education, Local Self government, Agriculture, etc.
Reserved subjects: (Governor-General responsible)- Police Administration of justice, Prison, Land revenue, Finance, etc.

3. It introduced Bicameralism and direct elections in the country for the 1st time consisting of an Upper House (Council of State) and a Lower House (Legislative Assembly).
4. It required that the 3 of the 6 members of the Viceroy's executive council (other than the Commander-in-Chief) were to be Indian.
5. It created a new office of the High Commissioner for India in London and transferred to him some of the functions.
6. Public Service Commission was established and a Central Public Service Commission was set up in 1926 for recruiting civil servants.
7. It separated Provincial budget from central budget.
8. It extended the system of *Separate Electorate for : Sikhs, Indian Christians, Anglo-Indians and Europeans.*

Government of India Act, 1935 *(Enforced on: 1st April 1937)*

1. It *abolished dyarchy in the provinces* and *introduced dyarchy at the Centre*, Provided autonomy to the Provinces.

2. It provided for the establishment of an All India Federation consisting of provinces and princely states as units.
3. It *introduced bicameralism in 6 out of 11 provinces.* (Bengal, Bombay, Madras, Bihar, Assam and the United Provinces).
4. It reserved certain no. of seats for Scheduled Castes, women and labours.
5. It *extended adult franchise* - Only 14% of total population had the right to vote.
6. *Reserve Bank of India was established.*
7. Federal Public Service Commission, Provincial Public Service Commission and Joint Public Service Commission were established.
8. *Federal Court was setup in 1937.*
9. *Burma (now Myanmar) was separated from India.*
10. The Act divided the powers between the Centre and units in three lists-Federal List (for Centre, with 59 items), Provincial List (for provinces, with 54 items) and the Concurrent List (for both, with 36 items)
11. Residuary powers were given to the Viceroy (Governor-General)
12. It abolished the council of 15 members.
13. Two new provinces were created : Sindh and Orissa.
14. Appointment of an Auditor-general.
15. Establishment of Federal Railway authority.

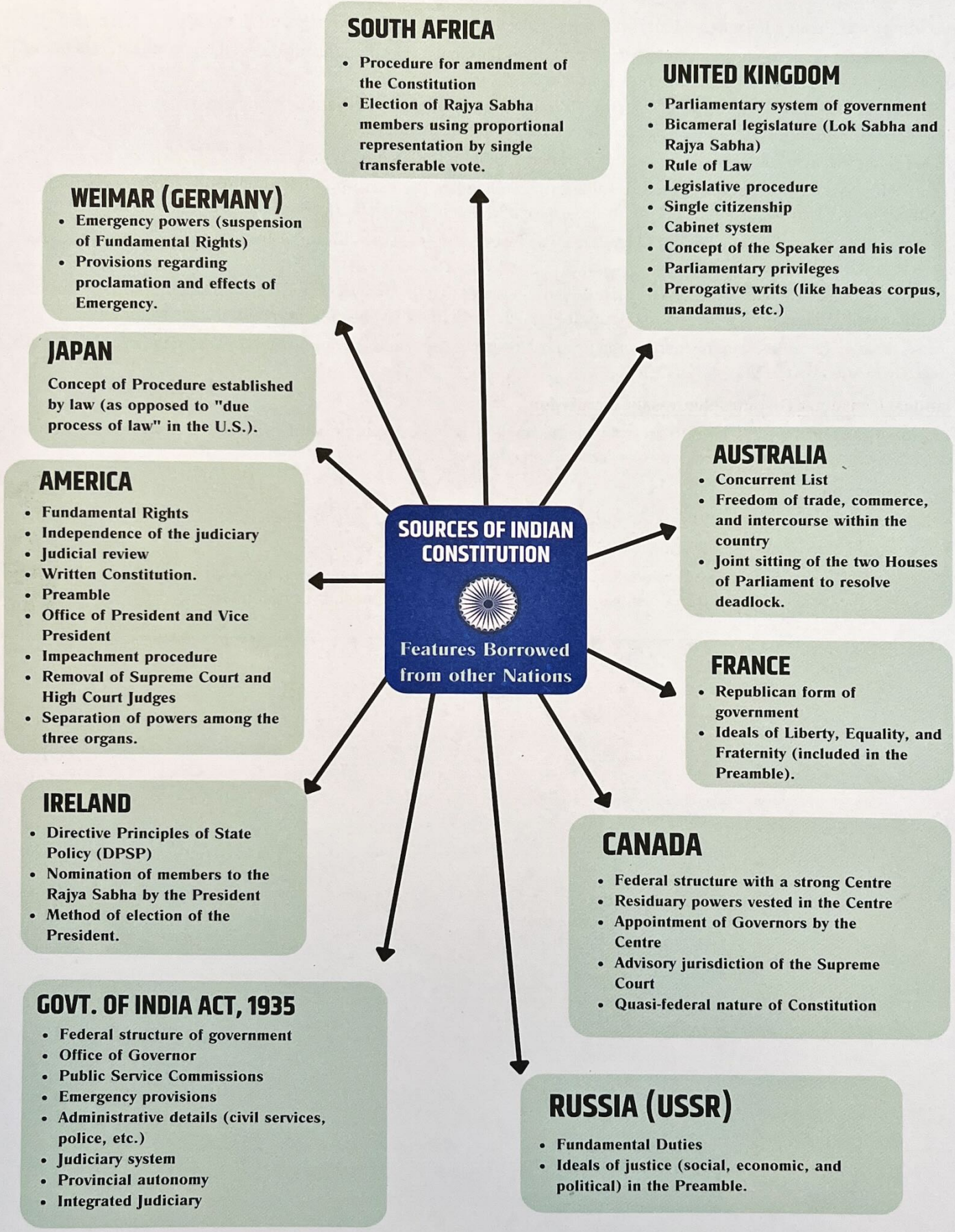
Indian Independence Act, 1947

1. It ***ended the British rule in India*** and declared India as an independent and sovereign state from August 15, 1947.
2. Partition of India and creation of two independent dominions of India and Pakistan with the right to secede from the British Commonwealth was done.
3. It *abolished the office of Viceroy* and provided a Governor General, who was to be appointed by the British King on the advice of the dominion cabinet.
4. It abolished the office of the Secretary of State for India and transferred his functions to the Secretary of State for Commonwealth Affairs.
5. It *proclaimed the lapse of British paramountcy* over the Indian princely states and treaty relations with tribal areas from August 15, 1947.
6. It granted freedom to the Indian princely states either to join the Dominion of India or Dominion of Pakistan or to remain independent.
7. The Governor-General would have full power to assent to any bill in the name of His Majesty.
8. It designated the Governor-General of India and the provincial governors as constitutional (nominal) heads of the states.
9. It dropped the title of Emperor of India from the royal titles of the King of England.
10. It discontinued the appointment to civil services and reservation of posts by the secretary of state for India.
11. It is also known as *the Partition plan/Mountbatten plan/ June 3rd plan.*

At the stroke of midnight of 14-15 August, 1947, the British rule came to an end.

- *1st Governor General of Independent India : Mountbatten*
- *1st and last Indian Governor General: C Rajagopalachari*

So now we have seen that our Indian Constitution is a unique and comprehensive document drawing upon the best practices from a variety of foreign constitutions to suit India's diverse needs. Here is a summarised culmination of all the sources of our constitution:



NOTEWORTHY POINTS

- The Age of Consent Act 1891 raised the minimum marital age for girls from 10 to 12 years.
- Manipur was the first in independent India to hold elections based on Universal Adult Franchise.
- 40th Constitutional Amendment Act, 1976: It brought India's maritime zones (territorial waters, continental shelf, EEZ) under Parliament's jurisdiction by amending Article 297.
- "Reward for Loyalty" in Ministerial Selection: It refers to the practice of appointing ministers as a recognition of their long-standing support, commitment and loyalty to the party or leadership.
- Sikkim has the smallest legislative assembly (Vidhan Sabha) in India with only 32 members.
- On 9 August 2021, the Parliament passed the Limited Liability Partnership (Amendment) Bill, 2021, amending the Limited Liability Partnership Act, 2008 to promote ease of doing business and decriminalize certain offences.
- Article 371A (Special provisions for Nagaland) was inserted in the Constitution of India by the 13th Constitutional Amendment Act, 1962.
- 'Legal Positivism Theory' was given by - John Austin, It states that law is a set of rules created and enforced by the state and the validity of law does not depend on morality of ethics (defined law as the command of the sovereign).
- Most cabinet committees are headed by the Prime Minister, except cabinet committee on parliamentary affairs which is usually headed by the Minister of Defence.

National Consumer Disputes Redressal Commission

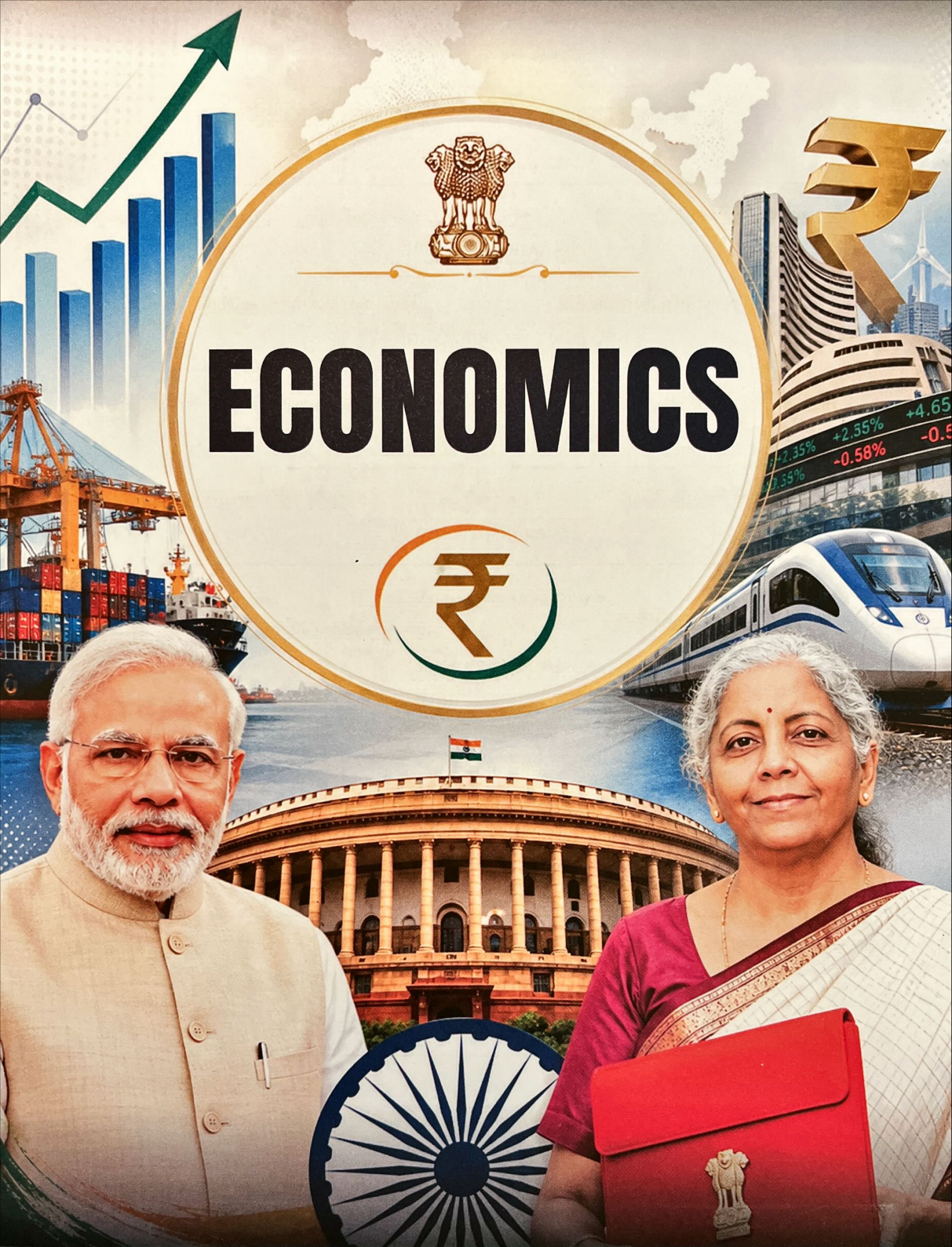
The National Consumer Disputes Redressal Commission (NCDRC) currently operates under the Consumer Protection Act, 2019, which replaced the previous Consumer Protection Act of 1986.

Pay Commission:

→ 1st: Established in January 1946 and reported in May 1947 under Chairman Srinivasa Varadachariar.

→ 2nd: Appointed in August 1957 under the chairmanship of Jagannath Das.

- ***Article 341 (1):*** Empowers the President, after consulting with the State Governor, to specify by public notification the castes, races, or tribes deemed to be Scheduled Castes in that state or union territory.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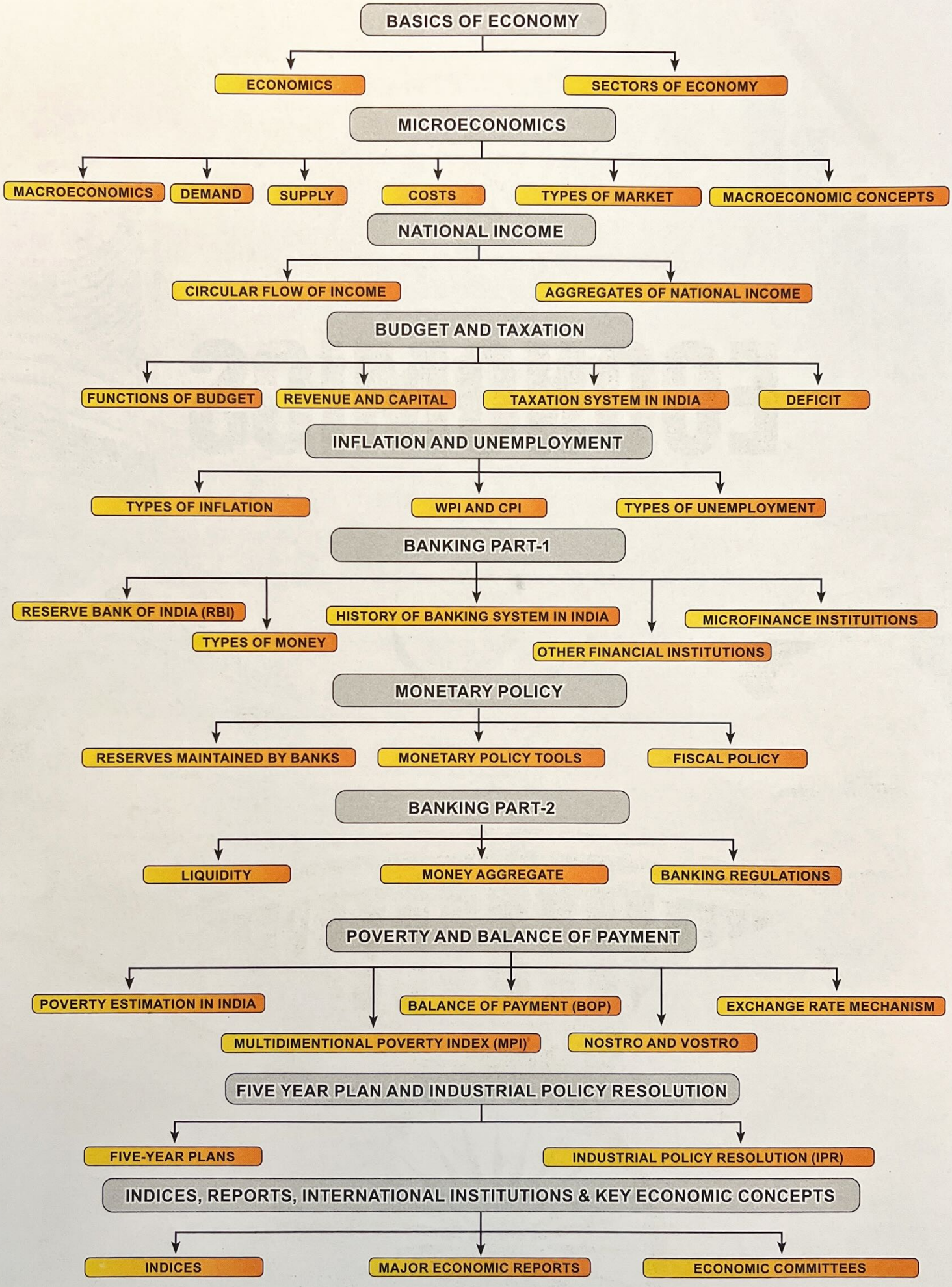
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ECONOMICS

• Economics is the study of how people, businesses, and governments use limited resources to produce, distribute, and consume goods and services. Economics is broadly divided into: *Macroeconomics and Microeconomics.*

Aspects	*Macroeconomics*	*Microeconomics*
Definition	It studies the economy as a whole	It studies individual consumers, firms, and markets
Approach	**Top down**	**Bottom up**
Focus Area	It is focused on the action of government and countries that are taken to influence broader economics like aggregate demand, aggregate supply, prices, etc.	It is focused with the action of individual or businesses including concepts like demand, supply etc.
Scope	Large-scale, entire economy	Small-scale, specific sector
Father	J. M. Keynes (from England) wrote the "General Theory of Employment, Interest and money"	Adam Smith (Founding Father of Modern Economy) wrote the book "The wealth of Nations"
Examples	GDP, inflation rates, fiscal policies, national income, unemployment rates	Pricing of a product, consumer behavior, competition in a market

The economic system can be classified based on Ownership, Motive and Government Role:

1. *Capitalist Economy* 2. *Socialist Economy*
3. *Mixed Economy*

	Capitalist	*Socialist*	*Mixed*
Ownership	Private ownership	Public or State ownership	Public + Private ownership
Economic motive	Profit	Social welfare	Both
Government role	No role	Complete involvement	Limited role
Income distribution	Unequal (High Inequality)	Equal (Theoretically)	Less unequal
Economic freedom	Complete	Lack of freedom	Limited freedom
Example	USA	USSR, North Korea	India

Socialist Economy (Centrally Planned Economy)

Government controls and makes decision regarding production, exchange, and consumption of goods and services. Eg: USSR.

Spillover Effect

Macroeconomics considers "spillover effect", where an event in one part of the economy (or world) impacts others. E.g. The great US depression affecting others

Key Historical Figures & Texts

Adam Smith

Known as: Father of Micro Economics / Father of Modern Economics

Key Work:

• The Wealth of Nations (1776)

Core Ideas:

• ***Invisible Hand:*** Markets regulate themselves through the forces of demand and supply, leading to efficient outcomes.

• ***Market Economy:*** Individuals pursuing their self-interest ("Animal spirit"- by J.M. Keynes) unintentionally promote overall economic welfare.

• ***Laissez-faire Policy:*** Advocated minimal government interference in economic activities.

Alfred Marshall

Also Known as: Father of Microeconomics

Key Work:

• Principles of Economics (1890)

Core Contributions:

• Developed the modern theory of demand and supply.

• Introduced concepts like elasticity of demand, consumer surplus, and partial equilibrium analysis.

John Maynard Keynes

Known as: Father of Macroeconomics

Key Work:

• The General Theory of Employment, Interest and Money (1936)

Core Ideas:

• Unlike the strict Laissez- Faire approach, Keynes argued that government intervention is necessary to manage "Animal spirits" and revive the economy during downturns.

• Supported fiscal policy and public spending to boost demand and employment.

Scarcity Definition of Economics (Given by Lionel Robbins)

Economics is science that studies human behavior as relationship between limited resources and unlimited wants.

Key wordings

- "Most of the decisions are taken as a result of animal spirits". - *John Maynard keynes*
- "Managing animal spirits requires active role of the government" - *Robert J. Shiller (Nobel Prize-winning economist)*
- "We need to revive the animal spirit in the country's economy" - *Manmohan Singh*

Classification of goods

Goods are classified based on two criteria: Excludability and Rivalry.

Definitions

- ***Excludability:*** Is it possible to prevent someone who hasn't paid from using the good?
  - ***Excludable:*** You must pay to use it (e.g. buying a ticket).
  - ***Non-Excludable:*** You cannot prevent anyone from using it (e.g. air, free YouTube videos).
- ***Rivalry:*** Does one person's consumption reduce the availability for others?
  - ***Rivalrous:*** If I consume it, you cannot (e.g. eating an apple, buying a limited edition car).
  - ***Non-Rivalrous:*** My consumption does not affect yours (e.g. watching a sunset, breathing air).

FOUR TYPES OF GOODS

Classification Based on Excludability and Rivalry

	RIVALROUS	NON-RIVALROUS
EXCLUDABLE	**PRIVATE GOODS** Excludable & Rivalrous. paid for, and consumption reduces availability for others. Examples: Food, clothing, cars, Parking spaces.	**CLUB GOODS** Excludable & Non rivalrous. paid for, but can be shared simultaneously without reducing supply. Examples: Cinemas, Private Parks, Netflix subscription.
NON EXCLUDABLE	**COMMON POOL RESOURCES** Non-Excludable & Rivalrous. Free to access , but finite supply (prone to depletion). Examples: Fish stocks in the ocean, Timber in a forests, coal.	**PUBLIC GOODS** Non-Excludable & Non Rivalrous. Free to all ; one's use doesn't hurt another's. Examples: National Defense, Air, Street Lights, Free-to-air TV.

Opportunity Cost : The value of the next best alternative given up. Natural resources like sunlight often have zero opportunity cost for the consumer.

Free Rider Problem : A challenge with Public Goods where people benefit without paying (e.g., using a street light without paying taxes).

SECTORS OF ECONOMY

There are three sectors of economy on the basis of nature of activities

1. *Primary Sector*
2. *Secondary Sector*
3. *Tertiary Sector*

Primary Sector (Red Collar Jobs)

- This sector is directly dependent on the environment.
- In India Primary Sector is mostly seen in *agricultural activities.*

Eg. Agriculture, Fishing, Hunting, Forestry, Mining.

- During British colonial rule in India, about 85% of the population lived in villages, with nearly 70–75% engaged in agriculture either directly or indirectly for their livelihood.

Agriculture Sector is considered "The backbone of Indian Economy"

Secondary Sector (Blue Collar Jobs)

- It is also called as *Manufacturing Sector.*
- They add value to natural resources by transforming raw materials into valuable products.

Blue-collar jobs involve physical work and use practical skills. These jobs are often in fields like construction, manufacturing, and maintenance.

E.g. Manufacturing, processing, building/construction, electricity etc.

- Secondary Sector is considered *backbone of a country, as it helps in industrialisation of a country*. Eg. China.
- Secondary sector job is not yet developed in India properly because we have directly leaped to tertiary sector.

Tertiary Sector (White Collar Jobs)

- It is also known as *Service Sector.*
- It is a part of economy, where business produce services.

E.g. Teaching, Transport, Advertising, Retail, Hospitality and Healthcare.

- It is mostly *intangible* (something which cannot be touched) in nature.

The Tertiary Sector is further subdivided into two specialized sector based on LEVEL OF KNOWLEDGE and EXPERTISE REQUIRED:

Quaternary Sector

- The Quaternary Sector focuses on knowledge-based activities and intellectual services.

• This sector is also known as the *"Knowledge Sector"*. E.g. Senior, Business Executive, Teaching, Manager, Banking, Chartered Accountant, Lawyer, Scientists.

Quinary Sector

• The Quinary Sector involves high-level, *knowledge-based activities that require expertise and advanced skills → All the decision making activities are involved here.*

• The activities in this sector are also known as *Gold Collar Jobs.*

E.g. Media, Financial Services, Education, Research Scientists, Information Technology, Policy makers, Activity of Politicians.

According to 2011 Census

	Primary Sector	*Secondary Sector*	*Tertiary Sector*
LFPR	54.6% (Highest)	24.3%	21.1%
% in GDP	14.39%	31.46%	54.15% (Highest)

"LFPR: Labour Force Participation Rate.

• *Percentage of women engaged in Primary Sector: 62.8%*

Sectors: On the basis of employment

Organized sector	*Unorganized sectors*
The organized sectors cover those enterprises where the term of employment is regular.	The unorganized sectors is characterized by small and scattered units which are largely outside the control of government.
They are registered by government. They follow rules and regulations and various laws such as the factories act, minimum wages act, payment of gratuity, shops and establishments act.	Unorganized sector does not follow any rules and regulation pass by the government.
Workers in the organized sector are paid according to prescribed scale. They also get payment in time on regular basis.	Most of the jobs are low paid and often not regular.
They get annual increment and other allowances such as provident fund, payment during holidays, paid leave, gratuity medical benefits, safe working conditions.	There is no provision of over time, paid leave, holidays, leave due to sickness etc.
They can form trade unions.	They cannot form trade unions.

Initiative for unorganised sector:

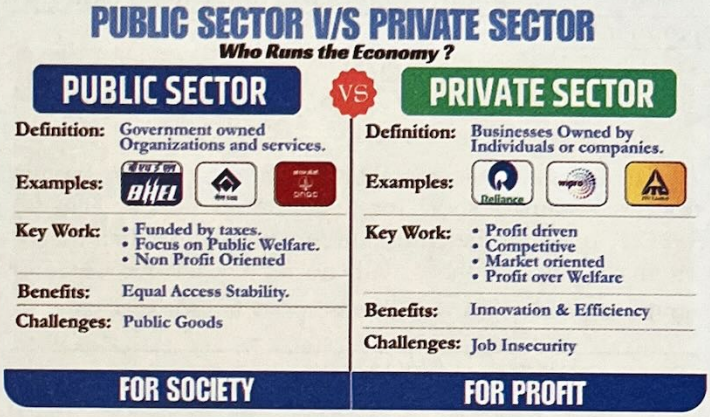
The E-Shram Portal, 2021 is a flagship initiative designed to create a comprehensive National Database of Unorganised Workers (NDUW) seeded with Aadhaar.

Real Vs Financial Sector

• *Real Sector :* It involves the actual production of goods and services using raw materials, such as land and labours.

• *Financial Sector:* Deals with Financial assets like mutual funds, stocks and banking services.

Sectors: On the basis of ownership



Normative Vs Positive Economics

Normative Economics	*Positive Economics*
It is based on opinion and value of the interpreter.	It is based on actual data, facts, and numbers.
Verification is not possible.	Results can be verified
No way to test feasibility and applicability in various field.	Safe and beyond doubt and can be proved scientifically.
It deals with idealistic situation.	It deals with actual and realistic situations.
E.g. The level of unemployment must be 5% maximum.	*E.g. The current unemployment rate is 20%*

Parallel Economy

• Parallel Economy refers to all the forms of activities through which black income is generated and those which are usually not accounted.

• It renders punctuation by Government punctuation.

• Unaccounted income from illegal activities like trafficking.

MACROECONOMICS

The fundamental problem of economics arises from the conflict between limited resources and unlimited human wants.

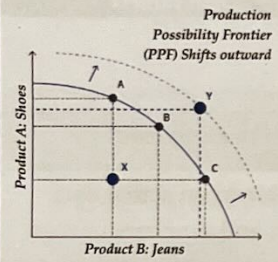
- **Scarcity:** Resources (money, land, labor, time) are finite.
- **Choice:** Because resources are limited, an economy cannot produce everything. It must choose how to allocate resources effectively.

The *production possibility of the economy* refers to all the possible combinations of goods and services that an economy can produce using the available resources and current technology.

Production Possibility Curve/Or Production Possibility Frontier (PPF):

- It is a graph that shows the different combinations of two goods or services that an economy can produce *when all resources are used efficiently.*

E.g. If a person has ₹ 6000, and they have two buying options: 6 pairs of shoes for ₹ 6000 and 6 pairs of jeans for ₹ 6000. Spending the entire amount on one product means buying 6 pairs of shoes with no money left for jeans, or buying 6 pairs of jeans with no money left for shoes.



Graph 1 characteristics:

- It shows the trade-off between two goods (e.g., Shoes and Jeans).
- **Slope:** Downward sloping (Negative slope) because to produce more of one good, you must produce less of the other due to limited resources.

Marginal Rate of Transformation (MRT):

- The slope of the PPC is determined by the MRT.
- It represents the amount of one good that must be sacrificed to produce one extra unit of another good.

- If they want more shoes, they must give up some jeans and vice versa. This also illustrates *inverse relationship* means that as we spend more *money on one product we have less money available for the other product due to limitation on budget.*

At any point

- On the curve: ***Full utilisation of resources***
- Down/under the curve: ***Under utilisation of resources***
- Up/Over the curve: ***Not achievable (due to limited resources).***

Opportunity Cost

- Opportunity cost means the value of *what you give up when you choose one thing over another.*

E.g. If a person has ₹ 6000 and can buy either a pair of jeans or a pair of shoes, choosing the jeans means they miss out on getting the shoes. The shoes are the opportunity cost.

Free Goods: Goods like air and sunlight have no opportunity cost because they are abundant in nature and not scarce. No sacrifice is needed to obtain them.

Utility

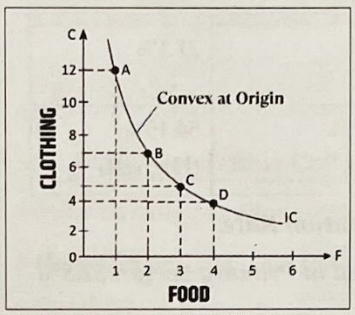
Utility is the satisfaction or benefit derived from consuming a good or service.

Types of Utility Measurement

1. **Cardinal Utility:** Satisfaction is measured in numerical values (Quantitative). *Less realistic.*
2. **Ordinal Utility:** Satisfaction is ranked (Qualitative/ Psychological). *More realistic.*

Indifference Curve

- A consumer's indifference curve is a graph that shows different *combinations of two goods that provide the consumer with the same level of satisfaction or happiness.*



Graph 2: A consumer's indifference curve

E.g. At point A, we have 1 unit of food and 12 units of clothing and point B, we have 2 units of food and 6 units of clothing. Both points make one equally happy, so they lie on the same indifference curve.

Graph Properties

- *Shape: Convex to the origin (Rectangular Hyperbola).*
- *Slope:* Determined by the *Marginal Rate of Substitution (MRS)* - the rate at which a consumer is willing to give up one good for another to maintain the same satisfaction.

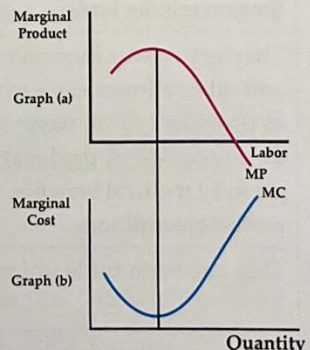
$$MRS = \frac{\Delta \text{ Sacrifice}}{\Delta \text{ Gain}}$$

- *No Intersection: Two ICs never intersect.*

Marginal Utility

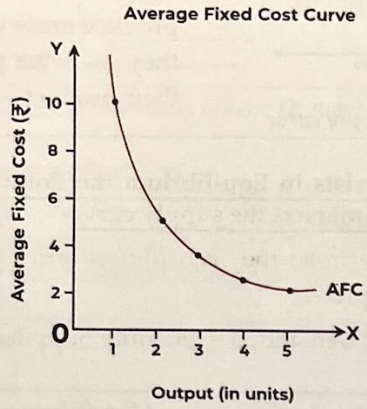
The *additional satisfaction or benefit* that a consumer derives from buying an additional unit of a commodity/ service.

- *Marginal Product (MP)* is the additional output produced by employing one more unit of a factor of production (usually labour).
- *Marginal Cost (MC)* is the change in total cost from producing one additional unit.
- *Marginal Revenue (MR)* is the additional income from selling one more unit.

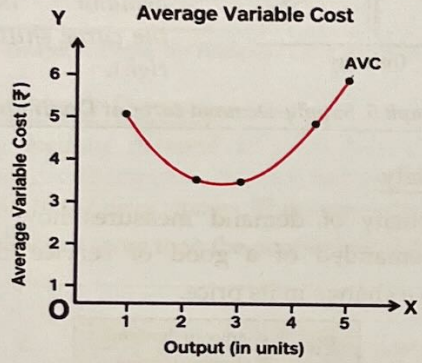


Average fixed cost curve and Variable fixed cost curve

The average fixed cost (AFC) is the total fixed costs (E.g. Rent) that remain constant while the number of goods and services produced by a company changes.



Average variable cost (VC) curve shows the relationship between a firm's variable costs (E.g. Raw materials) and its output level in the short run.

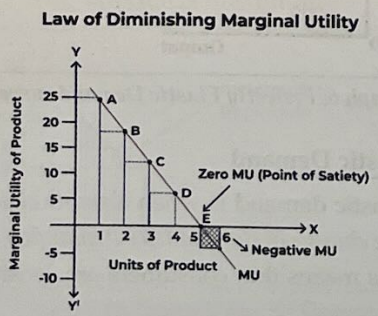


Average variable cost (AVC) + average fixed cost (AFC) = average total cost (ATC)

Law of Diminishing Marginal Utility

- The Law of Diminishing Marginal Utility states that as a person consumes more units of a good, the *additional satisfaction (utility) derived from each extra unit gradually decreases, assuming all other factors remain constant.*

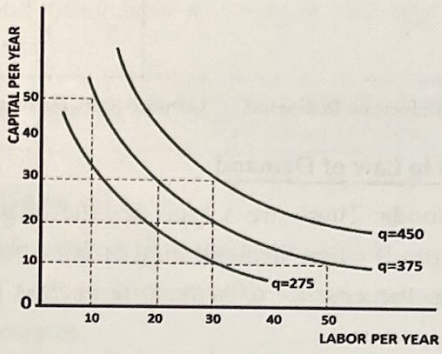
E.g. Jab tum pahla golgappa khate ho toh jo anand ki prapti hoti hai woh dusre golgappe main nahi hoti kyunki dhire dhire additional satisfaction (utility) kam hota jata hai.



ISOQUANT GRAPH

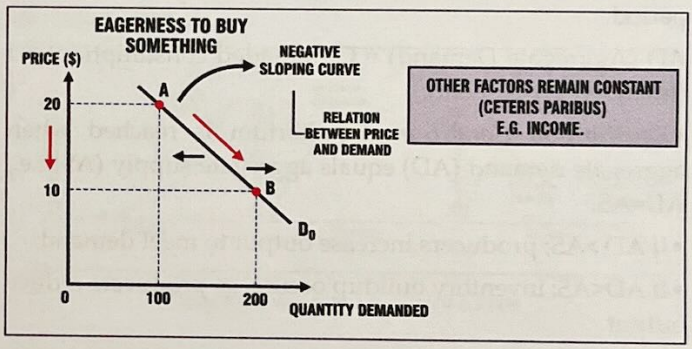
A curve showing combinations of inputs (eg. Labor and Capital) that produce the same quantity of output.

Slope: Marginal Rate of Technical Substitution (MRTS).



DEMAND

- The quantity of a good or service that consumers are willing and able to buy at a particular price during a specific period of time *(willingness + ability).*
- **Law of Demand:** It is a fundamental principle which states that there is an inverse relationship between price and quantity demanded.



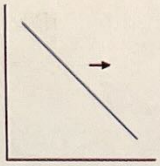
- There is an *inverse relationship between price and demand.* When the price of a product increases, people tend to buy less of it and when the price decreases, people usually buy more of it. *However, this is not always true, this is true only under given conditions:*

1. *When income is constant.* [P↑ D↓ / P↓ D↑]
2. *When price of other goods is constant.*
3. *When there is no change in preferences.*

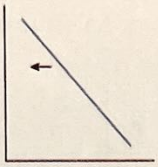
Movement and Shift in Demand Curve

- Movement in demand curve happens when there is a *change in price of the product.*
- Shift in demand curve occurs *when factors other than price change,* such as income, consumer preferences, or the price of related goods changes.

•Shift on the curve can occurs in *rightward or leftward position.*



Rightward Shift: Increase in demand.



Leftward Shift: Decrease in demand.

Exceptions to Law of Demand

•**Giffen Goods:** These are a type of *inferior goods/non-luxurious goods* where *demand may increase when prices rise,* due to the *absence of better alternatives or limited purchasing power.*

E.g. Increase in price of wheat.

•**Veblen Goods:** Veblen goods are *luxury goods* that have a *direct relationship between price and demand*. This means that the demand for Veblen goods *increases as their price increases*, which is the opposite of the law of demand.

E.g. iPhone, Mercedes.

Ex Ante (Expected) Aggregate Demand

Intended expenditure on goods and services during a given period.

AD (Aggregate Demand) = C (Intended consumption) + I (Intended investment).

•***Equilibrium Condition:*** Equilibrium is reached when aggregate demand (AD) equals aggregate supply (AS) i.e., AD=AS.

•If AD >AS; producers increase output to meet demand.

•If AD<AS; inventory buildup occurs, so producers reduce output.

NOTE: In macroeconomics treating a single commodity as representative of all goods allows simplification of aggregate analysis because it allows economists to model total production, price levels as a single variable.

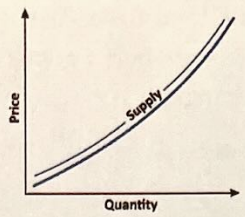
SUPPLY

•Supply is the amount of a product or service that is *available for purchase or use.*

Supply Curve

•A supply curve is a graphical representation of the *relationship between the price of a good or service* and the quantity that producers are willing and able to supply in a given period of time.

•Producer want to maximise profit.

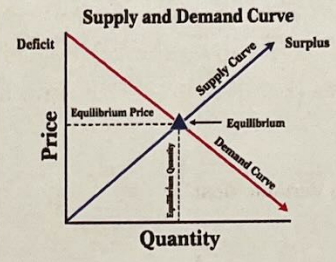


Graph 4: Supply curve

Positive sloping curve is seen. When there is a direct relation between price and quantity supplied. Producers produce more when they get better price for their product.

When things exists in Equilibrium the Point where the demand curve intersect the supply curve

- This determine the *"equilibrium price"* or market clearing price.
- Quantity Demanded = Quantity Supplied.



•*Equilibrium shifts, if any of the factors shift.*
•*If demand decreases, the curve shifts to the left while if the demand increases, the curve shifts to the right.*

Graph 5: Supply-Demand curve at Equilibrium

Price Elasticity

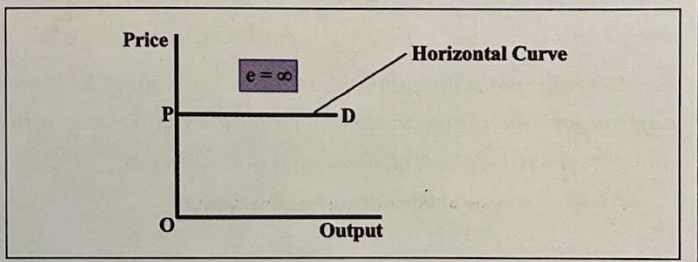
•Price elasticity of demand measures how much the quantity demanded of a good or service changes in response to a change in its price.

$$e_d = \frac{\%\text{ change in demand}}{\%\text{ change in price}}$$

Perfectly Elastic Demand

•In perfectly elastic demand, a *small rise in price results in a fall in demand to zero, while a small fall in price causes an increase in demand to infinity*. In such a case, the demand is perfectly elastic or ($e = \infty$)

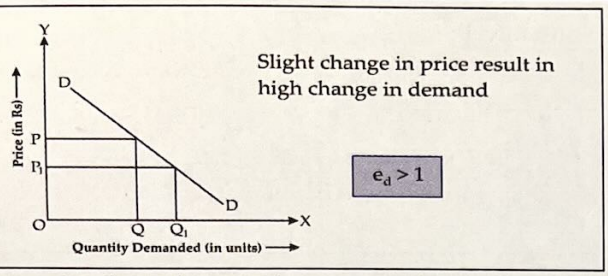
E.g. Luxury products such as gold and cars.



Graph 6: Perfectly Elastic Demand curve

Relatively Elastic Demand

•Relatively elastic demand is when a *small change in price leads to a large change in the quantity demanded of a product or service.* This means that consumers are sensitive to price changes.

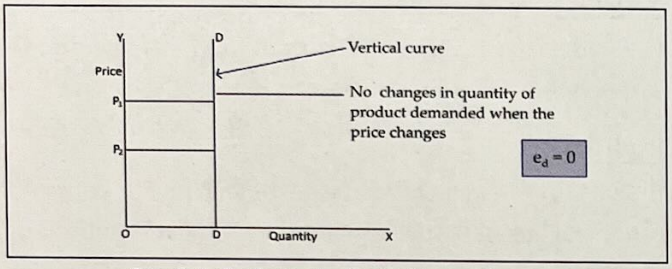


Graph 7: Relatively Elastic Demand curve

Perfectly Inelastic Demand

- Perfectly inelastic demand is *when the demand for a product remains the same regardless of price changes.* This means that the quantity demanded is fixed and does not change.

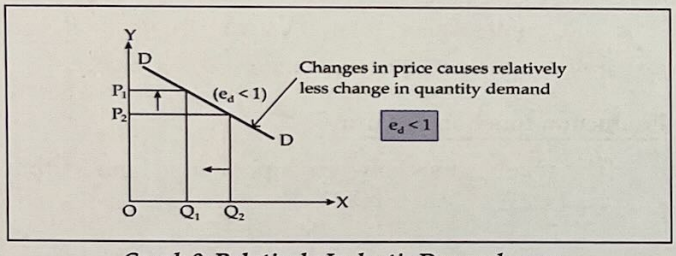
Eg. Necessary goods (water, wheat and rice).



Graph 8: Perfectly Inelastic Demand curve

Relatively Inelastic Demand

- Relatively inelastic demand is *when the demand for a product changes in response to price, but the change is not proportional to the price change.* This means that the price of a product changes more than the demand for that product.

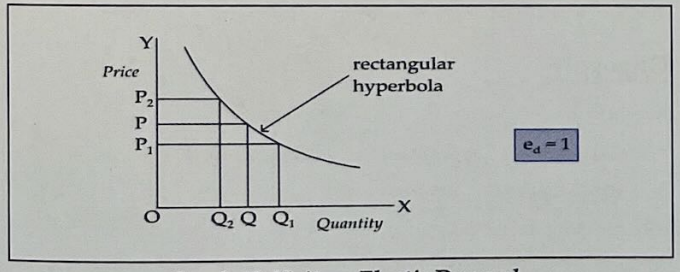


Graph 9: Relatively Inelastic Demand curve

Unitary Elastic Demand

The demand curve for unitary elastic demand is a *rectangular hyperbola*. It occurs when a change (rise or fall) in price results in an equally proportional change in demand.

- In this case total revenue is maximum



Graph 10: Unitary Elastic Demand

Income Elasticity

- Income elasticity of demand measures the relationship between a *change in the quantity demanded for a particular good and a change in real income.*
- For most goods, when income goes up, demand goes up. The demand curve shifts to the right, showing a positive relationship.

$$\text{Income Elasticity} = \frac{\%\ \text{of change in quantity demanded}}{\%\ \text{of change in income}}$$

1. Luxury Goods

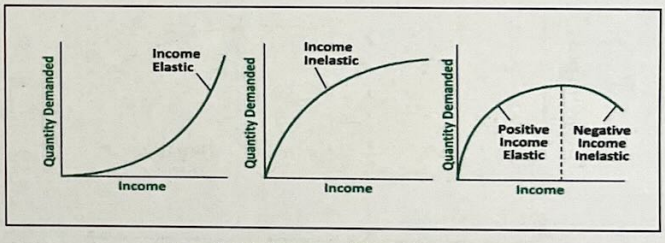
- Income Elasticity of Demand > 1 (Positive)
- Demand increases more than proportionately when income increases.
- People buy these goods mainly when their income rises.

Examples: Luxury cars, designer clothes, expensive vacations.

2. Inferior Goods

- Income Elasticity of Demand < 0 (negative)
- Demand decreases when income increases because consumers switch to better-quality goods.

Examples: Low-quality food grains, public transport instead of cars.

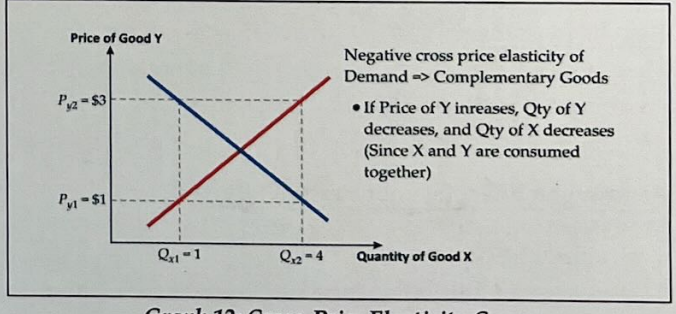


Graph 11: Income Elasticity Curve

Cross-Price Elasticity

- Cross-price elasticity is an economic measure of how a *change in the price of one good affects the demand for another good.*

E.g. If the price of Pepsi rises by 10% and Coke's demand increases by 5%.



Graph 12: Cross-Price Elasticity Curve

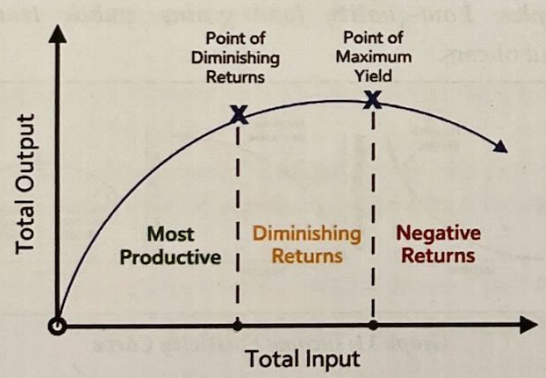
Substitute Goods vs Complimentary Goods

Substitute Goods	*Complimentary Goods*
They refer to those goods which can be used in place of one another to satisfy a particular want.	They refer to those goods which are used together to satisfy a particular want.
They have a competitive demand.	They have a joint demand.
Price of one substitute good, has positive relationship with quantity demanded of another substitute good.	Price of one complementary good has a negative relationship with the quantity demanded of another complimentary good.
E.g. Tea and Coffee, Coke and Pepsi.	*E.g. Tea and Sugar, Car and Petrol.*

Law of Diminishing Returns

After a certain level, additional inputs will lead to smaller gains in output.

It is applicable in short run production [a time period where at least one factor of production (typically capital) is fixed, while others, such as labour and raw materials are variable].



Abnormal Profits

Profits earned by a business firm over and above the opportunity cost of the factor inputs.

Optimum profit

Max achievable profit a business can attain, occurring when marginal revenue (MR) equals marginal cost (MC).

Regulated profit

Maximum earnings, prices, or rate of return set by government authorities for specific industries to prevent monopoly abuses and ensure fair consumer pricing.

Bandwagon Effect (Demonstration Effect)

Increase in demand of a commodity because others are also consuming the commodity.

Eg: Buying 2nd edition of Fatman, buying a new phone in market which everyone is buying.

Snob Effect

Decrease in demand of a commodity because others are also consuming the commodity; It is the opposite of Bandwagon effect.

Eg: Buying a limited-edition watch

COSTS

Fixed Cost

Remains constant regardless of production volume. *(e.g. Rent, License cost, Registration cost etc.)*

Variable Cost

It fluctuates directly with output *(e.g. raw materials, shipping.)*

Explicit Cost

It is a direct payment made to others in the course of running a business such as *wage, rent and materials.*

Sunk Cost

Cost incurred in the past and that cannot be recovered in the future. (*eg: Advertising expense, Legal and accounting fee.)*

Break Even Point of a firm

It is the point where total revenue equals total cost (expenditure). It is the point of *"no profit, no loss"*.

Production function of a firm

It is the relationship between inputs used and output produced.

TYPES OF MARKET

Monopoly

- One seller controls the entire market.
- No close substitutes for the product.
- High barriers to entry.
- *E.g. Indian railways*

Oligopoly

- A few large firms dominate the market.
- Products may be similar or differentiated.
- Many buyers for one product.
- No easy entry.
- *E.g. Telecom sector, laptop market*

Monopolistic Competition

- Many sellers and many buyers for a product.
- Products are similar but not identical (differentiated)
- Some control over price.
- Easy entry and exit.
- Highly Elastic (but not perfectly elastic)
- *E.g. Toothpaste*

Perfect Competition

- Many buyers and sellers.
- Products are identical (homogeneous).
- No barriers to entry.
- Price is determined by supply and demand.
- Price elasticity: Perfectly Elastic (Ed = ∞)

E.g. Agriculture products

MACROECONOMIC CONCEPT

Marginal Propensity to Consume

- Marginal Propensity to Consume (MPC) refers to the ***portion of additional income that a person spends on consumption rather than saving***. It measures how much consumption increases when income rises by one unit.
- MPC is ***dependent on the income level*** as it may vary with the income levels ***(MPC is lower at higher income levels)***.

$$MPC = \frac{\text{Change in Consumption } (\Delta C)}{\text{Change in Income } (\Delta Y)}$$

- *MPC value: 0 < MPC < 1*
- *E.g. If income rises by Rs. 10,000 and spending increases by Rs. 1,000, then:*

$$MPC = \frac{1000}{10000} = 0.1$$

Autonomous Expenditure

- It is the spending that occurs ***regardless of the level of income*** in an economy. It is ***independent of income***.

$C = A + cY$
A: Income-independent consumption
cY: Income-dependent consumption
- c : Marginal propensity to consume
- Y: Level of income

C: Total consumption

$Savings = 1 - c$

$Multiplier = \frac{1}{1-c}$

$MPC + MPS = 1$

MPC - Marginal Propensity to consume

MPS - Marginal Propensity to save

NATIONAL INCOME

• National income is the total value of all goods and services produced by a country's residents in a given year. It is a *"Macroeconomic"* concept.

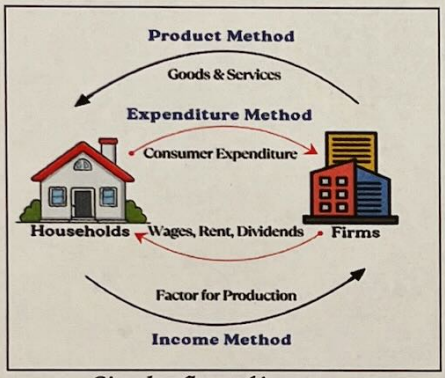
• For the first time, the concept of *National Income* was given by *Dadabhai Naoroji*.

• *PC Mahalanobis* headed the *National Income Committee (1949)*.

• *V.K.R.V. Rao* used a scientific approach to calculate National Income. *He also gave the two-sector economy classification*.

Circular Flow of Income

• The Circular Flow of Income is a model/concept often used to describe the *continuous movement of goods, services, resources, and money in an economy*.



Circular flow of income

• Households own land, labor, and capital. They provide these to firms in return for income (wages, rent, profits).

• Firms use these resources to produce goods and services and sell them to households.

• Households spend money to buy goods and services from firms (expenditure).

• Firms pay money to households for the resources they use (income).

• This cycle keeps the economy moving by maintaining a continuous flow.

Real Flow

Real flow refers to the movement of goods, services, and factors of production (land, labour, capital, entrepreneurship) between households and firms in the economy.

Money Flow

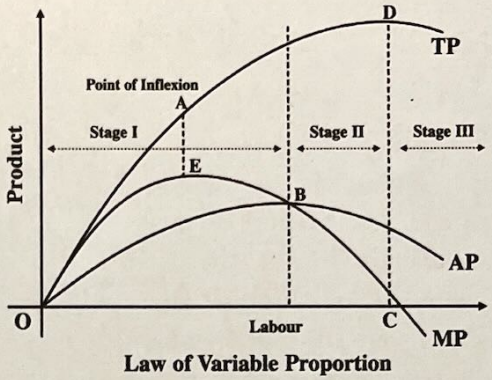
Money flow refers to the movement of money (payments) between households and firms in exchange for goods, services, and factors of production.

Factors of Production	*Factors of Payment*
Land	Rent
Labour	Wages
Capital	Interest
Entrepreneurs	Profit

Law of Variable Proportions

When we increase quantity of one factor of production (e.g. labour) while keeping others fixed.

The total output, first rise at increasing rate, then rise at decreasing rate, then declines.



Law of Variable Proportion

Two-Sector Model :

• This is the simplest model.

• Households and Firms

Three-Sector Model :

• This model introduces the Government sector

• Households, Firms, Government

Four-Sector Model: (Open Economy)

• Households, Firms, Government and Foreign trade

Injection (Money Entering the Economy)

• Injections are additional *funds that enter the economy*, increasing the total spending and income. They help expand economic activity.

Example

• Investment: When businesses spend money on capital goods like machinery or buildings to expand production.

• Government Spending: Public sector expenditure on goods and services like infrastructure, education, or defense.

• Exports: Sales of domestic goods and services to foreign buyers, bringing money into the domestic economy.

Leakage (Money Leaving the Economy)

• Leakages are *funds that exit the circular flow*, reducing total spending and slowing economic growth.

Example

• Savings: When households save instead of spending their income.

• Taxes: When people pay taxes to the government.

• Imports: When people spend money on foreign-produced goods and services.

Three Methods to Calculate National Income

1. Value Added Method/Production Method/Output Method

• It is a way to calculate the *value of a product or service at each stage of production*. It is also known as production method.

Value added method = Output-Input

Example

Value added in every stage.

Cotton	Yarn	Cloth	Shirt
Rs 100	Rs 200	Rs 400	Rs 800
Rs 100	Rs 100	Rs 200	Rs 400

• **Gross Value Added (GVA):** The value that producers add to goods and services they buy and sell.

$$GVA = GVA_1 + GVA_2 + GVA_3\ GVA + \ldots\ldots\ GVA_N$$

National Statistics Office (CSO) adopted the GVA in 2015

2. Income Method

This method includes *all the income generated by the factor of production* which are inputs in the process of producing final goods or services, in the entire economy.

Components of Income Method

(a) Compensation to Employees: It refers to the *total wages or salaries paid to workers for their product services.*

(b) Operating Surplus: It refers to the *profit earned by businesses* (profit, rent and interest) *after deducting employees compensation* (wages).

(c) Mixed Income: It is the income earned by *self-employed individuals and unincorporated businesses*. It arises when *elements of factor income (labour and capital) cannot be distinctly separated. E.g. A doctor running their own clinic.*

3. Expenditure Method

It is way to calculate a country's GDP by *adding up all spending on goods and services in the economy*. It's the most common method for calculating GDP.

Expenditure Method = C + G + I + (X–M)
C = Consumption
G = Government Expenditure
I = Investment
X= Export
M = Import

Orange Economy

It refers to the part of the economy that is based on creativity, culture, and intellectual property. It includes activities where ideas, talent, and cultural expression are converted into economic value and jobs.

Examples: Film industry, Music industry, Fashion design.

Final Goods	*Intermediate Goods*
These goods will now not undergo any economic process.	These are semi-finished products that will undergo various economic process and transformation to be converted to final products.
Goods used by the consumer for personal consumption or Investment.	Goods used as inputs for producing other goods and services and will get customised in the process.
Direct consumption or capital investment.	Further processing or resale.
E.g. When you buy tea from a shop for personal consumption, It is a final good.	***E.g. When a tea shop or hotel buys tea to prepare and sell tea to customers, it becomes an intermediate good.***

Every economy faces three fundamental problems due to scarcity of resources:

What to Produce? *How to Produce?* *For Whom to Produce?*

What to Produce?

This problem refers to deciding which goods and services should be produced and in what quantity.

An economy must decide how its limited resources should be allocated between different types of goods.

Types of Final Goods

Consumer Goods

Finished goods that are used directly by individuals for personal consumption and are not used to produce other goods.

Example: Clothes, food, smartphones.

Capital Goods

Goods that are used by businesses to produce other goods and services. They help in production and do not get consumed immediately.

Example: Machines used to produce T-shirts, factory equipment, tools.

Inventory

• It refers to the *items a business keeps in stock for sale or production purposes*. It can include raw materials, work-in-progress items and finished goods, depending on the type of business.

• If the sale of goods increases the inventory decumulates and if the sale of goods decreases the inventory accumulates. It can be either planned or unplanned.

Aids or Auxiliaries to Trade

Auxiliaries to trade refers to the factors that are essential for bringing the goods from the place of their production to the place of their consumption. In other words, these are essential services and functions that assist the business. *E.g. Transportation, communication, banking, insurance, warehousing, and advertising.*

Stock vs Flow

Stock	*Flow*
Static in nature	Dynamic in nature
It is a quantity measured at a point of time	It is a quantity measured over a period of time
E.g. Wealth, loan, inventory, capital, Money Supply	*E.g. Income, expenditure, change in inventory, depreciation*

AGGREGATES OF NATIONAL INCOME

Gross Domestic Product (GDP)

- GDP measures *total value of all final goods and services* produced within the territory of a country *within a financial year (Financial Year = 1st April-31 March).*

In GDP second hand goods are never counted.

GDP was developed by Russian-American Economist "Simon Kuznets" in 1934.

- While calculating GDP, value of *only final goods is considered* and not intermediate goods to avoid *Double Counting.*

Does GDP Reflect the Welfare of Society?

Although GDP is an important indicator of economic growth and production, it does not fully reflect the welfare or well-being of society.

Limitations of GDP as a Measure of Welfare

1. Ignores Income Distribution

GDP shows the total income of a country, but it does not indicate how that income is distributed among people. A country may have high GDP while many people \ poor.

2. Excludes Non-Market Activities

Activities such as household work, voluntary services, and caregiving contribute to welfare but are not included in GDP because they are not sold in the market.

3. Ignores Environmental Damage

Production that causes pollution or environmental degradation increases GDP but may reduce the overall quality of life.

4. Excludes Quality of Life Factors

GDP does not consider health, education, leisure, safety, or happiness, which are important for social welfare.

5. Underground Economy Not Included

Economic activities in the informal or black market are generally not counted in GDP.

Gross National Product (GNP)

- *Total value of all final goods and services produced by the nationals of the country.*

Net Domestic Product (NDP)

- It is the measure of a *country's economic output* after adjusting for the *depreciation (or consumption) of fixed capital.*

GNP = GDP-Factor Income to Abroad + FI from Abroad

OR

GNP = GDP+Net Factor Income from Abroad (NFIA)

- Monetary Value of an asset *decreases over time due to various factors* (E.g. wear & tear) and is called as *Depreciation.* It is seen in Capital Goods.

NDP = GDP - Depreciation

Net National Product (NNP)

- It is the *monetary value* of *finished goods and services* produced by a *country's citizens in a given period.*

NNP = GNP - Depreciation

Market Price (MP)	*Factor Cost (FC)*
The market price is the final value of the product being sold, which includes indirect taxes.	Factor cost is the cost of factors of production, or total value of inputs, where indirect tax is not included

FC = MP - Indirect tax + Subsidy

FC = MP - (Indirect tax - Subsidy)

FC= MP - Net Indirect Tax

Basic Price = FC + Net production tax

Net production tax = (Production tax - Subsidy)

REMEMBER : Product taxes are levied per unit of goods/ services sold (e.g., GST, excise duty, sales tax), whereas production taxes are paid regardless of output volume, such as land taxes, stamp duties, or license fees.

Production taxes are independent of production quantity, while product taxes depend on sales volume.

To Summarise

1. Gross से Net में जाना हो तो Depreciation substract करदो।
2. Domestic से National में जाना हो तो NFIA add करो।
3. MP से FC में जाना हो तो Net Indirect Tax को substract करो।

Calculation of income

Nation's Territory = GDP
Nation's People = GNP
Total Income = Total Expenditure = Total value of goods and services

Real GDP vs Nominal GDP

Real GDP	*Nominal GDP*
In this, a base year is taken as reference.	It is more than Real GDP due to Inflation.
It is calculated on constant prices.	It is calculated on current prices.
It is inflation adjusted.	Inflation is not adjusted here.

$$\text{GDP Deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

- GDP Deflator is also called as *"Implicit Price Deflation"* and *"Price Index"*.
- **GDP of India is calculated by:** *National Statistical Office (NSO) under Ministry of Statistics and Programme Implementation (MOSPI).*
- **The Base Year is considered as:** *2022-2023.*

Per Capita Income

- It is the average amount of money earned by each person in a specific area over a period of time.

$$\text{Per Capital Income} = \frac{\text{National Income}}{\text{Population}}$$

Purchasing Power Parity

- Purchasing power is the amount of goods and services that can be bought with a specific amount of money. It can also be referred to as *"a common basket of goods"*.
- As of *2026, India's GDP* ranked *5th in the world* and *India's economy* ranks at *3rd position in the world* in terms of *Purchasing Power Parity* after *USA* and *China (their economy is inflated)*

Personal Income

- Total income of an individual earned from all the sources before taxes.

Ranking of GDP (Nominal)
1. USA *2. China*
3. Germany *4. Japan*
5. India

PI = National Income (NI) + Income received but not earned-Income earned but not received

OR

PI = NI + Govt. transfers + Net interest paid by Govt. Corporate tax-payment for social security

PI = NI + Transfer Payment - Undistributed corporate profit "Transfer payment example: Government subsidies/ Scholarship/Pension

Personal Disposable Income

- It is the amount of money a *person has after paying taxes* and other mandatory withholding.

Disposable Income = Personal Income - Tax

Potential GDP

- It is the total output an economy would produce if its resources are fully utilised.

Green GDP = GDP-Environmental Damage

Potential GDP-Real GDP = Recessionary Gap

Gross Domestic Capital Formation:

The total investment made within a country in a given period of time to create or Increase physical assets.

E.g. Factory building, New machinery.

BUDGET

Budget

- It is an approximation of revenue and expenses over a specified period of time.
- *Article 112* of the Constitution of India requires the government to present an *Annual Financial Statement (an estimated statement of Receipt and Expenditure)* to the Parliament.
- The *President of India* is responsible for presenting the Annual Financial Statement to both houses of Parliament.
- Prepared by: *Department of Economic Affairs (Ministry of Finance)*
- Presented by: *Finance Minister*
- The *first Budget* was presented by *R K Shanmukham Chetty* and the *second budget* was presented by *John Mathai*.

Most Number of Budget

1. ***Morarji Desai → 10 budgets (Record holder) 6 times in a row***
2. ***P. Chidambaram → 9 budgets***
3. ***Nirmala Sitharaman → 9 budgets (including 9 consecutive budgets)***
4. ***Pranab Mukherjee → 8 budgets***
5. ***Yashwant Sinha → 8 budgets***

Gender Sensitive Budget: 2005-06

Indira Gandhi is the 1st female Finance Minister of India (temporary)

Child Budgeting was introduced by Govt in: 2008-09

Railway and General Budget

- In *1921*, the *Acworth Committee* recommended *separating the Railway Budget from the General Budget*. In *2016*, based on the recommendations of the *Bibek Debroy Committee*, the Indian government decided to *merge* the *Railway Budget with the General Budget*. This merger was implemented from the *2017-18 financial year*.

Functions of Budget

1. Allocation Functions

- It refers to the process of *dividing resources between public goods and private goods*, essentially deciding which social services and infrastructure projects to fund.

2. Redistribution Functions

- It aims to *reduce income inequality* by using *progressive taxation* (higher tax rates for higher earners) and providing social welfare programs like unemployment benefits.

3. Stabilisation Functions

- It is aimed at maintaining economic stability by adjusting government spending and taxation to counter recession (by increasing spending) or inflation (by decreasing spending).

Asset

An asset is a *resource with economic value* that an individual, a company, or a country owns or controls with the expectation that it will provide a future benefit. E.g. Gold, Property.

Liability

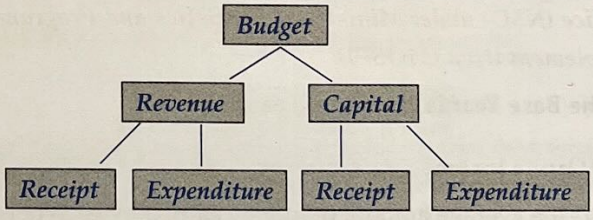
A liability represents the obligation or responsibility to fulfill a debt or duty to another party. E.g. Payment of loan.

REVENUE AND CAPITAL

- Budget is divided into two heads: *Revenue* and *Capital*.

Revenue

- Revenue refers to the funds that a government collects to *finance its activities and public services*. This primarily comes from taxes, as well as other sources like fees, fines, and duties.



- It is of two types: *Revenue Receipts and Revenue Expenditure*

Revenue Receipts

- These are earnings that *do not create liabilities or reduce assets*.
- Revenue Receipts *do not lead to claim on government* and are of *non-redeemable in nature*.

Sub-types

1. ***Tax Revenue:*** The income that is collected by governments through taxation. Eg. Wealth tax.
2. ***Non-Tax Revenue:*** It is the recurring income that is earned from sources other than taxes by the government. E.g. Interest on loans, PSU earnings, railway tickets.

Revenue Expenditure

•It is the amount of money spent that *does not lead to increase in assets nor decrease in liabilities.*

Sub-Types

1. ***Plan Revenue Expenditure:*** It is a government expenditure that is part of the *plan budget and does not create assets or liabilities.* **E.g. Government grants/financial assistance.**
2. ***Non-Plan Revenue Expenditure:*** It is the money a *government spends on its day-to-day operations, excluding capital expenditures. Eg. Salary/pension, interest payment (largest component of non-plan expenditure), maintenance of infrastructure.*

Capital

•It is the physical or financial resources that is used to produce value in an economy.

•It is of two types: *Capital Receipts and Capital Expenditures.*

Sub-Types

1. ***Capital Receipt:*** They are those receipts which *either create liabilities or reduce the asset value* of the government. It creates new liabilities and reduces an existing asset. E.g. Loan, disinvestment.
2. ***Capital Expenditure:*** It refers to the funds that organizations or governments allocate to acquire, upgrade, or maintain long-term assets such as property, infrastructure, or equipment. *It creates new assets for government and reduces liabilities. **E.g. Loan repayment, loan granted, developmental expenditure, infrastructure creation (roads, schools, hospitals).***

Fiscal Consolidation

•Central Government will target reaching a debt-to-GDP ratio of 50±1 % by 2030.

•The debt-to-GDP ratio is estimated to be 55.6 % of GDP in BE 2026-27, compared to 56.1 % of GDP in RE 2025-26.

•In RE 2025-26, the fiscal deficit has been estimated at par with BE of 2025-26 at 4.4 % of GDP. In line with the new fiscal prudence path of debt consolidation, the fiscal deficit in BE 2026-27 is estimated to be 4.3 % of GDP.

Kelkar committee (2002-03): recommended the simplification of direct taxes in post-liberalisation India

Kelkar Committee (2015): recommended improving the PPP model to enhance efficiency and transparency in infrastructure projects

The Raja Chelliah Committee (1991) was set up to reform India's tax system. It recommended reducing personal income tax and corporate tax rates, widening the tax base by removing unnecessary exemptions, simplifying the tax structure, expanding the MODVAT scheme to avoid cascading of taxes, and gradually reducing high customs duties to make the tax system more efficient and growth-oriented.

Taxation System in India

Direct Tax

•These taxes are *directly* payable to the government.

•*It cannot be passed onto someone else.*

•Direct taxes are *progressive* in nature.

•Here, the *marginal tax rate is greater than the average tax rate.*

E.g. Income tax, wealth tax, gift tax, capital gain tax, corporate tax.

Indirect Tax

•These are *indirectly* payable to the government.

•*It can be passed onto someone else.*

•Indirect taxes are *regressive/proportional* in nature.

E.g. GST, Excise Duty (petrol, diesel, aviation turbine fuel), Custom Duty.

Paper Tax

•Tax which carry their *significance only on paper* and have *no significance in terms of revenue yield* are called paper taxes.

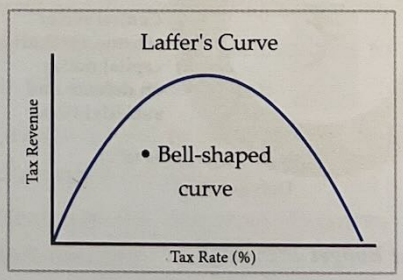
E.g. Wealth tax, gift tax, estate duty (not levied now)

Laffer's Curve

•The Laffer curve is a graph that shows the relationship between the *tax rates and government revenue.*

•The curve suggests that *increasing taxes beyond a certain point can actually decrease the revenue.*

•This is because higher taxes can discourage investment and consumption, and workers may work less if they believe their extra efforts result in lower income.



Goods and Services Tax (GST)

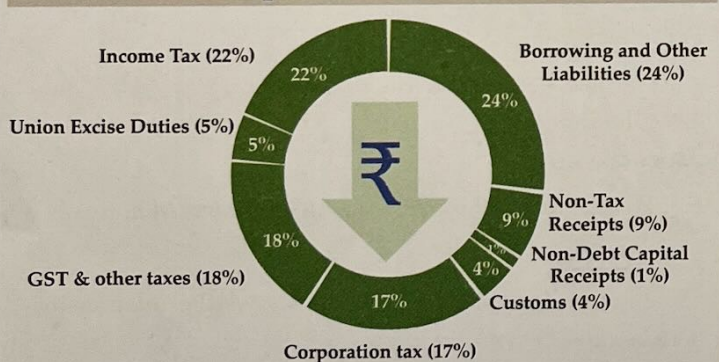
- It was introduced through *101st Constitutional Amendment Act*.
- The tax came into effect by: *1st July 2017*.
- According to *Art 279A*, GST council is a *constitutional body* which consists of *33 members (2 from Centre +31 from States/UTs)*. The Chairman of the GST Council is the *Finance Minister*.

Cascading Tax (Tax on Tax): Cascading tax refers to a situation where tax is levied on a product at every stage of production or distribution without giving credit for the tax already paid, resulting in tax being charged on previously paid tax, which increases the final price of the product.

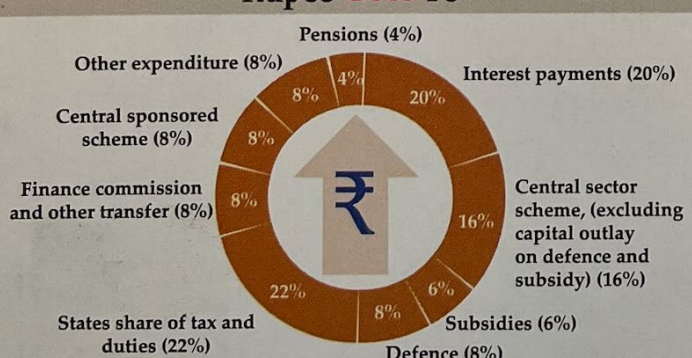
Other Taxes

- ***Surcharge:*** An *additional tax on income tax* for taxpayers above a certain income threshold.
- ***Cess:*** A *tax on tax liability* that is levied for a specific purpose → ***Surcharge*** and ***Cess*** are *levied by Central Government but not shared with the states*.
- ***Pigouvian Tax:*** A *tax on activities that cause negative externalities*, or external costs that are not included in the market price. It is levied to lower the negative externalities.

Rupee Comes From



Rupee Goes To



As Per Budget 2025-2026

WMA,1997 (Ways and Means Advances) Agreement

As per the agreement, the Central Government would meet temporary mismatches between receipts and expenditure through Ways and Means Advances (WMA) provided by the RBI.

Purpose: To manage temporary shortages in government cash flow, not a permanent source of finance.

Fiscal Responsibility and Budget Management Act, 2003 (FRBM)

- The Fiscal Responsibility and Budget Management (FRBM) Act was enacted to ensure fiscal discipline and responsible financial management by the Government of India.
- The FRBM Act was passed in *2003* to reduce fiscal deficit and improve transparency in government finances. It aimed to limit fiscal deficit to around *3% of GDP* and promote prudent management of public debt.

FRBM Review Committee

- It was formed on *May 2016* and headed by *NK Singh*. He gave few recommendation as below
- Debt-GDP Target: Total public debt should be 60% of GDP (40% for Centre + 20% for States).
- Fiscal Deficit Target: Reduce fiscal deficit to 2.5% of GDP in the medium term by 2023
- Escape Clause: Government can deviate from fiscal deficit target by 0.5% of GDP in exceptional situations like war, national security issues, natural disasters, or economic slowdown by 2023
- Fiscal Council: Recommended setting up an independent Fiscal Council to monitor fiscal discipline

1. ***Medium Term Fiscal Policy Statement:*** This statement outlines a *3-year rolling target for key fiscal indicators*, such as revenue and fiscal deficits etc.
2. ***Fiscal Policy Strategy Statement:*** This outlines the government's *financial goals* and the methods it plans to use to achieve them.
3. ***Macroeconomic Framework Statement:*** This provides an *overview of the country's economic situation*, including details like the GDP growth rate.

Table 1: Deficit and debt targets (% of GDP)

Year	Fiscal Deficit	Revenue Deficit	Debt
2017–18	3.0%	2.1%	47.3%
2018–19	3.0%	1.8%	45.5%
2019–20	3.0%	1.6%	43.7%
2020–21	2.8%	1.3%	42.0%
2021–22	2.6%	1.1%	40.3%
2022–23	2.5%	0.8%	38.7%

Crowding In:

Crowding in occurs when government spending (especially on infrastructure and public investment) encourages and stimulates private sector investment, leading to higher overall economic activity.

Crowding Out:

Crowding out occurs when increased government borrowing or expenditure raises interest rates and reduces private sector investment, as the government competes with the private sector for available funds.

A Budget can be classified into three types:

1. ***Balanced Budget:*** It is a condition where the total revenues are equivalent to the total expenditure *(Receipt = Expenditure)*.
2. ***Surplus Budget:*** It is a condition when total income or receipts exceeds its total expenditures *(Receipt > Expenditure)*.
3. ***Deficit Budget:*** It is a condition when expenses exceed the revenue *(Expenditure > Receipt)*.

Deficit Financing (By J.M Keynes)

Deficit financing refers to a situation where government expenditure exceeds its revenue and the gap is financed by creating new money or by borrowing funds.

Methods of Deficit Financing:

Debt Financing:

It refers to raising funds through borrowing, where the government or a firm takes loans from banks, financial institutions, or issues bonds and the amount must be repaid with interest.

Equity Financing:

It refers to raising funds by issuing shares, where investors become owners (shareholders) of the company and share in profits through dividends, without any obligation to repay the capital.

Deficit

- A deficit is when the expenses exceed revenue.

Types of Deficit

1. ***Budgetary Deficit:*** It occurs when government's total expenditures exceed its *total revenues from taxes and other sources*. This indicates that the government is spending more than it is earning, leading to borrowing.

> ***Budgetary Deficit = Total expenditure - Total Receipt***

2. ***Revenue Deficit:*** It occurs when a *government's revenue expenditure exceeds its revenue receipts.*

> ***Revenue Deficit = Revenue Expenditure - Revenue Receipt***

3. ***Effective Revenue Deficit:*** It is the difference between *revenue deficit and grants used to create capital assets.*

> ***Effective Revenue Deficit = Revenue Deficit - Grant given for the developmental purpose***

4. ***Fiscal Deficit:*** It represents the total borrowing requirement of government. It occurs when *total government expenditure exceeds the sum of total receipts (excluding borrowings).*

> ***Fiscal Deficit = Total Exp - [Total receipt-Debt creating Capital Receipt)***
> ***(Loans/Borrowing)***

OR

> ***Total expenditure - (RR+Non debt Capital Receipt)***

5. ***Primary Deficit:*** It is defined as the difference between the *fiscal deficit and the previous year interest payments of the government.*

> ***Primary Deficit = Fiscal Deficit - Interest Payment***

> ***Externalities: An externality is an indirect cost or benefit to an uninvolved third party that arises as an effect of another party's activity. It can be Positive or Negative.***

16th Finance Commission

The Finance Commission is a constitutional body under *Article 280* of the Constitution of India, constituted by the President every *5 years* to recommend the distribution of tax revenues between the *Centre and the States*.

The *16th Finance Commission* was constituted on *31 December 2023* under *Article 280(1)* of the Constitution. The Chairman is *Arvind Panagariya* and the commission consists of *1 Chairman and 4 Members*.

Its functions include recommending:

- ***Vertical Devolution*** – It refers to the share of the total divisible pool of central taxes given to all states collectively. The Government has accepted the recommendation of the Finance Commission to retain the vertical share of devolution at *41%*.
- ***Horizontal Devolution*** – It determines how that *41%* share is distributed among individual states. It is determined by *Income Distance (42.5%)*, *Population (17.5%)*, *Area (10%)*, *Forest* and *Ecology (10%)*, *Demographic Performance (10%)* & a *10%* weight for contribution to *GDP* (added through 16th Finance Commission)
- Grants- in-aid to states from the Consolidated Fund of India under *Article 275*.
- Measures to improve finances of Panchayats and Municipalities.

Fiscal Matter (Budget context):

Table 2: Criteria for distribution of central taxes among states		
Criteria	**15th " FC (2021-26)**	**16th " FC (2026-31)**
Income Distance	45%	42.5%
Population (2011)	15%	17.5%
Demographic Performance	12.5%	10%
Area	15%	10%
Forest	10%	10%
Tax and Fiscal Efforts	2.5%	-
Contribution to GDP	-	10%
Total	**100%**	**100%**
Sources: Reports of the 15th and 16th Finance Commissions; PRS.		

A provision of ₹1.34 lakh crore has been made to the states for *FY 2026-27* as Finance Commission grants, including Rural & Urban Local Body grants and Disaster Management grants.

Operation Twist

Operation Twist is a monetary policy tool used by the Reserve Bank of India in which it simultaneously buys long-term government securities and sells short-term securities to reduce long-term interest rates and manage the yield curve. When RBI buys long-term bonds, their prices increase and yields fall, making long-term loans cheaper.

INFLATION

- *Inflation is increase in the general level of prices of Goods and Services.*
- Purchasing power *decreases* in case of inflation.
- During inflation the *debtor/borrower benefits more than the lender.*

E.g. If you borrow ₹ 10,000, from a lender at a fixed interest during inflation, the money you repay is worth less than when you borrowed it. As when inflation occurs, the general price goods and services increases, meaning the value of money decreases. When you repay the ₹ 10,000, the money you return has less purchasing power than when you borrowed it.

Real Interest Rate = Nominal Interest Rate - Inflation

Fisher's Quantity Theory

- Irving Fisher gave the *"Money Illusion"* concept.
- Fisher's Quantity Theory explains the relationship between money supply, velocity of money, price level, and transaction.

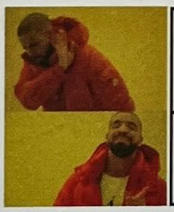
$MV = PT$

M = Money Supply *P = Price Level*
V = Velocity of Money *T = Transaction*

- The equation suggests that an *increase in the money supply (M) will lead to an increase in the price level (P) assuming that the velocity of money (V) and the level of transactions (T) are constant.*
- The theory also implies that changes in the money supply have a *direct impact on inflation*, as an increase in the money supply leads to an *increase in the price level*, which in turn *reduces the purchasing power of money.*

Types of Inflation

1. *Creeping: 3-4%*
2. *Walking: 4-10%*
3. *Running: 10-20%*
4. *Galloping: 20-100%*
5. *Hyper: >100%*



Mehngai Daayan khaae jaat hai ✗

Inflation Daayan khaae jaat hai ✓

Inflationary Gap: When Demand exceeds Supply. In this case Actual GDP exceeds Potential GDP

Seigniorage

The profit earned by the central bank by printing currency .

Seigniorage is the profit earned by central bank through issuing currency, calculated as the difference between the face value of money and its production cost.

Seigniorage = Face value - Production cost

Causes of Inflation

Demand Pull Inflation	*Cost Push Inflation*
It is caused by an increase in demand (demand side inflation)	It is caused by an increase in production costs (supply side inflation)
It can be caused by strong economic growth, increased government spending or increased exports	It can be caused by increased wages, raw material prices, or indirect taxes
It can be short-term	It can be long-term
"Too much money chasing too few goods", an expression that describes demand-pull inflation	Increase in cost of any factors of Production and Input Cost

Measurement of Inflation

- Wholesale Price Index (WPI) and Consumer Price Index (CPI) is used to measure inflation.

Inflation Rate Formula

To find the percentage rate of inflation between two years:

$$\text{Inflation Rate} = \frac{(\text{Current Year Index} - \text{Previous Year Index})}{\text{Previous Year Index}} \times 100$$

Wholesale Price Index (WPI)

- It measures the average change in prices of goods at the *wholesale level.*
- It also reflects the change in prices of goods before they reach consumers.
- ***Published by:*** *Office of Economic Adviser (OEA) under Ministry of Commerce and Industry*
- Base Year: *2022-23* *(Previously by : 2011-12)*
- It is published: *Monthly (14th day of each month)*

Weightage Distribution in WPI

- ***Manufactured goods (64.2%)***
- ***Primary articles (22.6%)***
- ***Fuel and power (13.15%)***

$$WPI = 100 \times \frac{\text{Cost of a fixed basket of goods in the current year}}{\text{Cost of fixed basket of goods in base year}}$$

Consumer Price Index (CPI)

- It measures the average change in prices of goods and services at the *consumer / retail level.*
- It reflects the cost of living for consumers.
- ***Released by:*** *National Statistical Office (NSO) under Ministry of Statistics and Programme Implementation (MOSPI)*
- Base Year : *2023-24.*
- Frequency: *Monthly (usually 12th day of each month)*

Weightage Distribution in CPI:

- *Food and Beverages (highest 45.8%)*
- *Housing (10%)*
- *Fuel and power (6.8%)*

$$CPI = 100 \times \frac{\text{Cost of a fixed basket of goods and services in the current year}}{\text{Cost of a fixed basket of goods and services in base year}}$$

Four types of CPI are as follows

- *CPI for Industrial Workers (IW) Base year: 2016*
- *CPI for Agricultural Labourer (AL) Base year: 2019*
- *CPI for Rural Labourer (RL) Base year: 2019*
- *CPI (Rural/Urban/Combined)→ Base Year: 2024, published by National Statistical Office (NSO) under MoSPI*

• CPI-AL, CPI-RL, CPI-IW released by the Labour Bureau

- *CPI combined is used by RBI for inflation targeting and formulating monetary policy.*

Producer Price Index :– Measure the average change in selling prices received by domestic producers for their output.

• ***Perspective*** :– Unlike CPI (buyer's perspective), PPI looks at inflation from the seller's perspective.

• ***Significance*** :– It captures price changes at the "factory gate" before taxes and distribution costs are added.

• It is considered a leading indicator because cost increases here are usually passed on to consumers later.

Monetary Policy Framework Agreement (MPFA)

It was signed between *GoI & RBI in Feb, 2015*
It mandates the RBI to maintain price stability while keeping growth in mindset with a goal to maintain *CPI Inflation at (4 ± 2)%*

Core Inflation

• Core inflation is a measure of inflation that *excludes food and energy prices*. It's calculated using the consumer price index (CPI)

Core Inflation = Headline Inflation-Volatile Inflation

Index of Industrial Production (IIP)

• It is a statistical indicator that measures the *growth of industrial production in a country over time*.

- *Base Year: 2022-2023.*
- *Published by: National Statistical Organisation (NSO) under MOSPI.*

• *Eight* core industries have 40% contributions in IIP in decreasing order:

Refinery Products → Electricity → Steel → Coal → Crude Oil → Natural Gas → Cement → Fertilizers

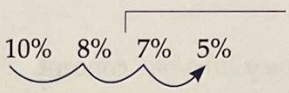
TYPES: INDICATOR AND DYNAMICS OF INFLATION

Disinflation

• *The decrease in the rate of inflation, while prices may still be rising.*

• It is measured by the change in the inflation rate from one year to the next.

• *Cause:* A slowdown in the economy's money supply through a tighter monetary policy.



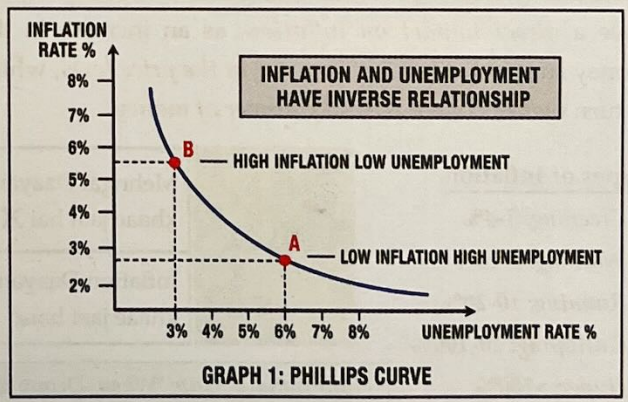
Deflation

• It is a *general decrease in price of goods and services. In deflation purchasing power increases.*

• *Cause:* Reduced money supply, reduced investment, or lower production.

Phillips Curve

• It is a graph that shows the relationship between *unemployment* and *inflation* in an economy.



GRAPH 1: PHILLIPS CURVE

Stagflation

• It is a period of *high inflation and low economic growth*. It's a combination of the words "stagnation" and "inflation" *(Stagflation = Stagnation + Inflation)*

• When stagflation increases, *high unemployment* is a direct consequence.

• *Cause:* When the production of goods and services in an economy slows down or declines.

Shrinkflation

A situation where the price of a product remains the same but the quantity or size of the product is reduced, effectively increasing the price per unit.

Bottleneck Inflation

A situation where production or supply is restricted at a particular stage of the production or distribution process, causing a slowdown and leading to shortages and price rise.

Skewflation

A situation where prices of essential goods (especially food items) rise sharply while prices of non-essential goods remain stable or rise slowly, causing an uneven or skewed pattern of inflation in the economy.

Reflation

A deliberate government policy to increase the level of economic activity and prices by increasing money supply, government expenditure, or reducing taxes, usually to recover from recession.

Imported Inflation

Inflation that occurs when the prices of imported goods and raw materials increase, which raises the overall price level in the domestic economy.

Inflationary Gap

The excess of aggregate demand over aggregate supply at full employment level, which leads to upward pressure on prices.

Inflation Target

The specific rate of inflation that a country's central bank aims to maintain through monetary policy to ensure price stability.

UNEMPLOYMENT

- Unemployment refers to a situation when a person actively searches for the job but is unable to find work.

National Sample Survey Office (NSSO) uses three methods to measure Unemployment.

1. *Usual status approach*
2. *Current weekly status approach.*
3. *Daily status approach.*

Unemployment

Parmar Sir to students: "Dil dukha hai lekin tuta toh nahi aur ummeed ka daaman abhi chhuta to nahi hai".

A. Usual Status (US) Approach

Reference period: Last 365 days (1 year) preceding the date of survey.

- Used to identify long-term or chronic unemployment.
- Usual Status has two components:

1. *Principal Status (PS)*

The activity in which a person spent most of the time during the last 365 days.

- Determined using the majority time criterion.

2. *Subsidiary Status (SS)*

A person may perform additional economic activity for at least 30 days during the year apart from the principal activity.

- This is known as Usual Status (PS + SS).

B. Current weekly status (CWS):

In labour force for last 1 week; If able to find work for at least 1 hour on any 1 day → Employed

C. Current Daily Status (CDS):

It measures the intensity of unemployment
In labour force for 1 day;
If work >4hrs=100% engaged
If work 1-4hrs=50% engaged
If work <1hr= unemployed

UNEMPLOYMENT MEASUREMENT

- ***Labour Force Participation Rate (LFPR):*** The percentage of persons in the labour force (working or available for work) in the population.
- ***Worker Population Ratio (WPR):*** The percentage of employed persons in the population.
- ***Unemployment Rate (UR):*** The percentage of person unemployed among the persons in the labour force.

Types of Unemployment

Structural Unemployment

- A type of unemployment that occurs when there is a ***mismatch between the skills of the workforce and the skills required for available jobs.***

E.g. An advancement in technology like advanced machinery can replace farmer labour.

Educated Unemployment

- Educated unemployment is when people with ***academic degrees are unable to find employment***. It can also be called ***graduate unemployment***.
- It is seen in ***urban*** part of India.

E.g. An engineering graduate, who is unable to find a job in their field because they lack practical skills.

Frictional Unemployment

- A *short-term* type of unemployment that occurs *when people search for better job* that's why it is also called *Search/Voluntary unemployment*.

E.g. An employee leaving a current job to move to a better one as frequently seen in urban cities.

Disguised Unemployment

- A type of unemployment where *more people are working than actually needed*, meaning their removal *would not affect productivity*.

Eg. A family of five works on a farm in rural area that could be run by three people.

Cyclical Unemployment

- A type of unemployment that occurs when the *labor force is reduced* due to *business cycles or economic fluctuations*. When economy revives, there is an opportunity to employment (mostly seen in *urban areas*).

E.g. Great Recession.

> **NOTE:** *Great Recession*
>
> Significant prolonged downturn of economic activity for 2 or more consecutive quarters E.g : US Subprime Lending crisis whereas prolonged recession is termed as depression. E.g. Great depression of USA (1929-1939)

Seasonal Unemployment

- A type of unemployment that occurs during specific times of the year. The employment is based on *seasonal basis and is mostly seen in rural part of India*.

Ex: Lights or firework sellers during Diwali.

Classical Unemployment

- It is also known as *real wage unemployment*, it occurs when the *real wage for a job is too high, which leads to more job seekers than job openings.*

E.g. When workers negotiate for a minimum salary that's more than what a company can afford.

Natural Unemployment

- Natural unemployment refers to the *lowest unemployment level* a healthy economy can *sustain without causing inflation.*

Marginal Worker vs Main Worker

Marginal Worker	*Main Worker*
Marginal worker is someone who is employed for less than 6 months or 183 days.	Main worker is someone who is employed for more than 6 months or 183 days.
E.g. Landless agricultural laborers and people who work in low-wage industries.	E.g. Construction workers, seasonal employees, independent contractors.

BANKING: PART 1

Reserve Bank of India (RBI)

- Reserve Bank of India (RBI) was established as an independent body based on the recommendations of *Royal Commission* on Indian Currency & finance. It was headed by *Hilton Young in 1926*.
- The RBI was officially established under the *Reserve Bank of India Act* in *1934* and started operations on *1st April 1935* in *Calcutta*.
- RBI was nationalised on *1st January 1949*.
- The headquarter was moved to *Mumbai* in *1937*.
- First Governor of RBI: *Sir Osborne Smith*
- First Indian Governor of RBI: *Sir CD Deshmukh*

Logo of RBI features a tiger and a palm tree.

Central Board of Directors

- It is the apex governing body of the Reserve Bank of India (RBI), established under the RBI Act of 1934 to provide direction to the bank's affairs. Appointed by GOI for 4 years.

The Board comprises

- The Governor (Chairperson)
- 4 Deputy Governors (full-time)
- 10 non-official directors from various fields
- 2 government officials (Ministry of Finance)
- 4 directors representing the Local Boards.

RBI introduced Banking Ombudsman scheme in: 1995
Fixed Rate Repo were announced by Govt in 1997

LEAD BANK SCHEME

- Launched by the RBI in December 1969.
- It assigns a specific public or private sector bank to lead the development of banking and credit services in a particular district.
- It promotes an *"Area Approach"* to enhance rural credit, financial inclusion, and priority sector lending (PSL).

Functions of RBI

1. ***Regulator of Banks:*** RBI under the *Banking Regulation Act of 1949*, holds extensive authority to regulate the country's banking system and hence called as *"Bank of Banks"*. ***E.g. It grants licenses to banking companies, ensuring they meet specific criteria before commencing operations, regulation of Cash Reserve Ratio (CRR) and Statutory Liquidity Ratio (SLR), the RBI also influences interest rates through monetary policy instruments like the repo rate (the rate at which banks borrow from the RBI).***

Narasimham Committee - I (1991)

Focus: Banking sector reforms & liberalisation.

Key Recommendations:

- Reduction in SLR and CRR to improve liquidity in the banking system.
- Introduction of prudential norms for income recognition, asset classification, and provisioning.
- Adoption of capital adequacy norms (as per Basel standards)
- Greater autonomy to banks and reduction in government interference.
- Promotion of a competitive and efficient banking system.
- Entry of private sector banks.

Narasimham Committee - II (1998)

Focus: Strengthening reforms & global competitiveness.

Key Recommendations:

- Reduction of Non-Performing Assets (NPAs)
- Strengthening of banking supervision and regulation.
- Consolidation and merger of banks to create strong global banks.
- Creation of Asset Reconstruction Funds/Companies (ARCs) to deal with bad loans.
- Strengthening of capital adequacy and risk management systems.
- Recommendation of 3-tier banking structure.

2. ***Monetary Authority:*** The RBI formulates and implements monetary policy to *control inflation, manage money supply, and ensure adequate credit flow to various sectors of the economy*.
3. ***Currency Printing:*** The RBI prints and manages currency in India, including banknotes *(except for ₹1 note and coins issued under Ministry of Finance, GOI)*
4. The RBI is often referred to as the *"lender of last resort"* (it acts as the final source of funding for commercial banks when they are unable to secure loans from other sources during financial crises).

> In India, currency is printed in ***Nasik, Dewas, Mysore, Salboni*** and the coins are minted in ***Mumbai, Hyderabad, Calcutta, Noida***.

The *Bimal Jalan Committee (2018-19)*, appointed by the RBI, recommended a new Economic Capital Framework (ECF) that enabled transferring surplus reserves to the government while maintaining a Contingency Risk Buffer (CRB) of **5.5%–6.5%** of the RBI's balance sheet.

Types of Money

1. Fiat Money

- It is a type of currency that a government declares as *legal tender, meaning it is authorised by government to be used as a medium of exchange*. It is issued by a central bank and is *not backed* by a physical commodity like *gold or silver*.

2. Fiduciary Money

Fiduciary money is money that is accepted as a medium of exchange due to the *trust that exists between the payer and the payee*. Ex Cheques, tokens/bitcoins.

3. Plastic Money

- Plastic money, also known as electronic money, is a payment method that uses electronic fund transfers instead of cash.
- It includes debit cards, credit cards, and prepaid cards.

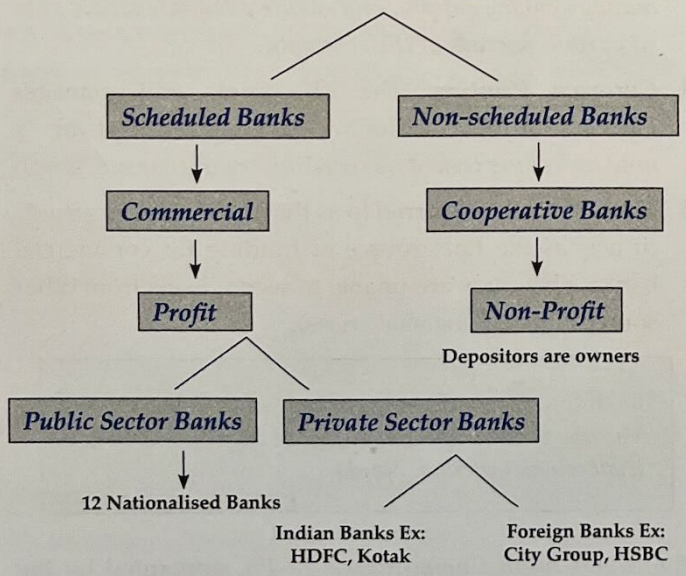
4. Hot Money

- Hot money refers to funds that investors *quickly move between countries or financial markets* to take advantage of short-term opportunities such as *stocks, deposits, bonds, etc.*

Clean Money Policy

- RBI introduced *Clean Note Policy in 1999*, asking the banks to not pass on the *soiled, torn, and scribbled notes to the customer and deposit the same to the RBI*.
- This was introduced under *Section 35A* of the *Banking regulation Act, 1949*.

According to RBI Act 1934, banking system can be classified as



- *State Bank Of India* was the only nationalised bank then, The *14 banks* were nationalised through *The Banking Companies(Acquisition & Transfer Of Undertaking) Act, 1969* with total deposit of more than *50 crore*, later on *6 banks (Andhra Bank,Corporation Bank, New Bank of India, Oriental Bank of Commerce, Punjab and Sind Bank, Vijaya Bank)* were nationalised through, *The Banking Companies(Acquisition & Transfer Of Undertaking) Act, 1980* with a deposit of *more than 200 crore*.

HISTORY OF BANKING SYSTEM IN INDIA

- *Bank of Hindustan* was the first bank to be established in *1770* in *Calcutta*.
- During the British Rule in India, three Presidential Banks: *Bank of Calcutta (1806), Bank of Bombay (1840)*, and *Bank of Madras (1843)* were eventually *merged into a single bank → Imperial Bank of India in 1921*.
- The Imperial Bank of India was later *nationalised* and renamed as *State Bank of India* in *1955*.
- First Indian owned bank is *Allahabad Bank*, established in *1865*.
- *Regional Rural Banks (RRB)* was established as a *statutory body* under *RRB Act 1976* to enhance financial activities in rural areas. E.g. Grameen Banks.
- *Pratham Grameen Bank* was set up on *2nd October 1975* in *Moradabad, Uttar Pradesh* (First one).

In Regional Rural Banks (RRB)

- The *Central Government* holds *50%* ownership in RRBs, making it the largest stakeholder.
- *Commercial banks* that sponsor RRBs hold *35%* ownership and provide financial and operational support.
- The respective *State Government* where the RRB operates holds *15%* ownership.
- They are supervised by *NABARD* and regulated by *RBI*.
- RRBs were set up on the recommendations of the Narsimham Committee on Rural Credit.
- The consolidation of RRBs began in 2005, following the recommendations of the Dr. Vyas Committee (2001)

The Kelkar Committee (1986) recommended strengthening RRBs by increasing their authorized capital to Rs 5 crore and paid-up capital to Rs 1 crore, directing surplus funds into profitable investments. It also suggested merging weak, uneconomic RRBs.

Function Of Commercial Banks

Primary Functions of Commercial Banks:

Accepting deposits from the public (saving, current, and fixed deposits) and providing loans and advances such as cash credit, overdraft, and bill discounting.

Secondary Functions of Commercial Banks:

Providing agency services (collection of cheques, payment of bills, acting as agent) and general utility services (locker facility, demand drafts, foreign exchange, cards, and online banking).

OTHER FINANCIAL INSTITUTIONS

National Bank of Agriculture and Rural Development (NABARD)

- NABARD was established on *12 July 1982*, on the recommendation of *B. Sivaraman Committee (1979)* through *NABARD Act 1981*.
- *Headquarter*: *Mumbai*

Functions of NABARD

- It offers loans and financial assistance to promote *agriculture growth and rural development*.
- It oversees and regulates the working of *cooperative banks* and *RRBs* to ensure their financial stability.
- Unlike commercial banks, *NABARD does not provide loans or banking services to individuals* (meaning: It does not deal directly with public).
- It provides various rural financing schemes through *PMAY (Pradhan Mantri Grameen Awas Yojana), KCC (Kisan Credit Cards) RuPay Kisan Cards*.

> *In 2015, NABARD had launched initiatives E-Shakti' and 'LEDP (Livelihood and Enterprise Development Program)*

National Housing Bank

- It was established in *1988* through → *Act of 1987*.
- *Headquarter: New Delhi*

Small Industries Development Bank of India (SIDBI)

- It was established on *2nd April 1990*.
- *Headquarter: Lucknow*

Securities and Exchange Board of India (SEBI)

- It was established as statutory body on *12th April 1988* through *SEBI Act of 1992*.
- *Headquarter: Mumbai*
- *Chairman*: *Tuhin Kanta Pandey*

Functions of SEBI

- It safeguard the interests of investors in the securities market.

Insurance Regulatory and Development Authority (IRDAI)

- It was established as a statutory body on *April 2000* through *IRDAI Act of 1999*.
- *Headquarter: Hyderabad*

National Agricultural Co-Operative Marketing Federation Of India Limited (NAFED)

- It was established on *2 October 1958*.
- It is an apex organisation of agricultural produce marketing cooperatives.
- *Headquarter: New Delhi*

Industrial Development Bank of India Limited (IDBI)

- It was established by GOI in 1964 as a subsidiary of the RBI. LIC (Life Insurance Corporation of India) later acquired 51% stake in the bank.
- *Headquarter: Mumbai*

MICROFINANCE INSTITUTIONS (MFI)

- MFIs provide *micro-credit* and other financial services like loan, savings, insurance, and remittances to *low income population*.
- MFIs provide a collateral-free microfinance loan to households having income upto *3 lakh/annum*.
- *Father of Microfinance system: Muhammad Yunus (in 2006, he won Nobel Peace Prize for creating Grameen Bank)*
- *First Micro Finance institution in India: Self Employed Women Association (SEWA) Bank*, which was established in *Ahmedabad* in *1974*.

Business Model of Micro Finance Banks

- The business model of Microfinance Banks revolves around providing small loans and financial services to low-income individuals, primarily in rural area through various schemes and groups.

Self Help Groups (SHG)

- It is a group of *10-20 people Below Poverty Line (BPL)* who come together to find ways to improve their living conditions in rural areas.
- SHGs provide *collateral-free loans* to members at *lower interest rates* than the informal sector.
- SHGs also help *women* and *other marginalized groups* become more self-reliant.

Joint Liability Groups (JLG)

- It comprises a group of *4-10 people* who come together to apply for a bank loan.
- By forming a JLG, individuals can avail of *collateral-free loans* and expand their businesses without worrying about security or margin.
- This loan is offered to *individuals, tenant farmers, sharecroppers, and small and marginal farmers.*

Pradhan Mantri Mudra Yojana (PMMY) Scheme

- This is a government scheme that promotes financial inclusion by providing *micro-credit or loans to small businesses.*

The loans are categorised into

- ***Shishu:*** *Covering loans upto ₹ 50,000*
- ***Kishor:*** *Covering loans above ₹ 50,000-₹ 5 lakh.*
- ***Tarun:*** *Covering loans above ₹ 5 lakh-₹ 10 lakh.*
- ***Tarun Plus:*** *Covering loans above ₹ 10 lakh-₹ 20 lakh.*

Non-Banking Financial Companies (NBFCs)

- NBFCs are also known as *Non-banking Financial Institutions (NBFIs),* that offer various banking services but do not have a banking license.
- They are registered under *Companies Act of 1956* and are regulated by RBI under *RBI Act 1934.*
- They *cannot accept Demand Deposits* (like savings/ current accounts) and *cannot issue cheques.*
- NBFCs provide *loans against Gold* and these are called *Gold Loans.*
- *Deposits are not guaranteed in NBFCs.* If an NBFC fails, depositors may lose their money, as there is no government protection.
- They are *not required* to maintain *CRR* and *SLR* like banks.

(* *Explained in the next chapter Pg. 232*)

Non-Banking Financial Company-Micro Finance Institution (NBFC-MFI)

- They are registered under RBI and regulated by RBI.
- They provide micro loans/micro financial services to *low-income individuals, especially in rural areas,* who lack access to formal banking services.
- NBFC-MFIs were established based on the recommendations of the *Malegam Committee (2010)* → also looked after the issues of MFIs.
- As per RBI guidelines, for entities other than NBFC-MFIs, the maximum limit on microfinance loans is *25% of their total assets.*
- To qualify for NBFC-MFI licence they are required to have *75% of their total assets* in the form of microfinance loans *(earlier this was 85%, however the guidelines were revised in 2022)*

Capital Requirements for NBFCs

For *NBFC-MFI (Microfinance Institutions),* the minimum *Net Owned Fund (NOF)* requirement is tiered based on geography:

General (All over India): Must have a minimum *NOF of 5 crore.*

North-East Region: Requires a lower minimum *NOF of 2 crore* to encourage financial inclusion in that specific area.

Payment & Settlement Act 2007

All payment systems in India (like *UPI, NEFT, RTGS,* and *Credit Cards*) are regulated by the RBI under the Payment and Settlement Systems *Act, 2007.*

Priority Sector Lending (PSL)

- The RBI mandates that banks allocate a specific portion of their lending to sectors that impact large segments of the population.
- ***Commercial Banks (Domestic & Foreign):*** *Must allocate 40% of ANBC (Adjusted Net Bank Credit) to PSL.*
- Regional Rural Banks (RRBs) & Small Finance Banks (SFBs): Have a higher target of 75% of ANBC.
- ***NBFCs:*** Generally, NBFCs do not have specific PSL targets like commercial banks.

Specific Sub-targets:

Agriculture: 18%.
Weaker Sections (SC, ST & Women's): 12%.

- Non-Achievement: If banks fail to meet these targets, the shortfall is deposited into the *Rural Infrastructure Development Fund (RIDF),* managed by *NABARD.*

Urban Cooperative Banks (UCBs)

- ***They operate under two regulatory bodies:*** *RBI & Registrar of Cooperative Societies (RCS).*

- ***MUDRA: Micro Units Development & Refinance Agency Ltd.***
- ***Launch year: 8 April 2015***
- ***It receives 100% funding from SIDBI.***

MONETARY POLICY

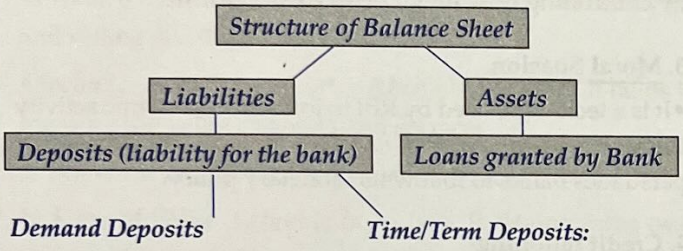
•Monetary policy refers to the regulation of the money supply and interest rates by the RBI to maintain price stability, control inflation, and ensure economic growth.

•RBI uses various monetary policy tools to achieve these objectives, which are categorized into *quantitative* and *qualitative instruments*.

•For the better understanding of Monetary Policy, we first need to learn about Assets and Liabilities of a Bank.

Balance Sheet

•A bank's balance sheet is a *financial statement that shows its Assets* (what the bank owns) and *Liabilities* (what the bank owes to others, including depositors).



Demand Deposits
- *Savings accounts*
- *Current accounts*

Time/Term Deposits:
- *Fixed deposits (FDs)*
- *Recurring deposits (RDs)*

Net Demand and Time Liability (NDTL)

•NDTL refers to the total deposits held by a bank, which determines the money available for lending.

•It is an important factor in determining reserve requirements set by RBI, are of two types:

NDTL consist of

1. **Demand Liabilities:** Deposits that can be withdrawn at any time. (E.g. Savings and current accounts).
2. **Time Liabilities:** Deposits with a fixed tenure (E.g. Fixed deposits and recurring deposits).

Reserves Maintained by Banks

•RBI keeps a part of *NDTL as a reserve*. This is done through two mechanisms: *CRR (Cash Reserve Ratio) and SLR (Statutory Liquidity Ratio).* This is done to ensure that Banks have sufficient vault cash to cater any emergency situation.

Cash Reserve Ratio	*Statutory Liquid Ratio*
Banks must keep this reserve in cash with the RBI.	Banks must keep this reserve in liquid assets like cash, gold, or approved securities.
Banks don't earn interest on money kept as CRR.	Banks earn interest on money kept as SLR.

Monetary Policy Committee (MPC)

•The Monetary Policy Committee (MPC) was established based on the *Urjit Patel Committee's recommendations*.

A total of 6 members were suggested:

•3 members from RBI, that includes *RBI Governor*, *Deputy Governor*, and an *Executive*. The RBI Governor is the chairman.

•3 members from the Government of India.

The MPC meets bimonthly to decide monetary policy actions, such as changes in repo rate and CRR.

MONETARY POLICY TOOLS

Monetary Policy Tools used by RBI

Quantitative Tools

•These tools influence the overall money supply and credit in the economy.

1. *Cash Reserve Ratio (CRR)*
2. *Statutory Liquidity Ratio (SLR)*
3. *Bank Rate (BR)*

•It is an interest rate at which *RBI provides loan to commercial banks for a long-term without keeping any securities/collateral*.

•Higher bank rates make borrowing costlier, reducing money supply and lower bank rates make loans cheaper, increasing liquidity.

4. *Open Market Operations (OMO)*

•It is also called as *sterilization*.

1. *Outright Purchase:* *RBI directly buys government securities* without any kind of repurchase agreement.
2. *Repurchase Obligation (Rere):* When *banks borrow money from RBI*, using government securities as collateral and with a promise of repurchasing them later, it is called as *Repo*. Similarly, when RBI invites bank to deposit their extra funds in RBI in exchange of government securities, it is called as *Reverse Repo*.

"Repo and SDF Special Depository Facility are collectively known as Liquidity Adjustment Facility (LAF)

Special Depository Facility (SDF) is a facility by which banks deposit excess money with the Reserve Bank of India without giving any collateral.

Collateral (गिरवी)

Collateral is something valuable that a borrower gives as a guarantee for a loan. If the borrower fails to repay, the lender can take the collateral to recover the money.

5. Marginal Standing Facility (MSF)

- MSF is a way for banks to borrow money from the RBI in emergencies, when they don't have enough funds. It allows banks to get *"overnight loans" but at a higher interest rate than the repo rate.*
- If the bank fails to maintain the required *CRR* and *SLR*, it must pay a penalty of *3% above the Bank Rate for each day of default.*
- Under MSF, banks can use *G-Secs within their SLR quota to borrow funds from RBI. Only scheduled commercial banks can access MSF.*

> *Minimum rate below which banks are not allowed to lend money is called as Base Rate.*

- If banks are unable to maintain the required CRR and SLR, they may borrow funds from the other banks in the *Interbank Lending Market*, This borrowing occurs at *Call Money Rate* (it is decided on basis of *RRR* and *MSF*), which is the interest rate charged for *short-term, overnight loans* between banks and other financial institutions.
- Limit: 2% of NDTL.

MCLR (Marginal Cost of Funds Based Lending Rate):

- MCLR is the minimum interest rate below which banks cannot lend, It was introduced by the *Reserve Bank of India* in April 2016 to make loan interest rates more transparent and responsive to policy rate changes.

Money Multiplier (MM)

- The Money Multiplier (MM) is the highest possible extent to which the money supply can increase due to changes in bank deposits.

$$\text{Money Multiplier} = \frac{1}{CRR}$$

> *NBFC and NBFC-MFI need not to maintain CRR and SLR.*

- When *CRR increases*, banks keep more money as reserves. They have less money to lend. Fewer loans mean less money creation. This *reduces the money multiplier and vice versa.*

Monetary Policy and Inflation/Deflation Control

Situation	*RBI Action*	*Effects*	*Policy*
During inflation	Increase in CRR, SLR, BR, RRR, RR	Decrease in money supply	Contractionary/ Tight/Dear/Hawkish Monetary Policy
During deflation	Decrease in CRR, SLR, BR, RRR, RR	Increase in money supply	Expansionary/Easy/ Dovish Monetary Policy

Qualitative Monetary Policy Tools

- These are selective tools used by RBI to control the use and direction of credit in specific sectors of the economy.
- *The central bank limits the amount of loans and advances that commercial banks can give.*

1. Changing Margin Requirements

- The RBI *increases the margin (the amount borrowers must pay upfront) for non-essential sectors to limit excessive borrowing* and reducing it for important sectors like *agriculture* to encourage lending.

2. Consumer Credit Regulation

- RBI *sets rules on loan installments, down payments, and repayment periods in advance.* This helps manage inflation by controlling how much people can borrow.

3. Moral Suasion

- It is a technique used by RBI to influence economic activity through *persuasion* and *implicit threats.* RBI advises or persuades banks to follow its monetary policy.

4. Credit rationing

- Credit rationing is when RBI *limits the total amount of loans* and *credit banks can issue to certain sectors.* It fixes the credit supply for each bank, preventing excessive lending. It also *sets credit limits for different sectors to ensure balanced lending.*

FISCAL POLICY

- Fiscal policy is the government's strategy to manage the economy by adjusting taxes, government spending, and borrowing. *It is used to control inflation or deflation, unemployment, and economic growth.*

When the government wants to control inflation, it can take the following steps

- **Increased Taxes:** *Higher taxes reduce people's disposable income*, leading to lower spending and demand.
- **Lower Subsidies:** *Reducing subsidies makes goods and services more expensive*, discouraging excessive consumption.
- **Lower MSP (Minimum Support Price):** A lower MSP *discourages excessive crop production* and *controls the rise in food prices* by keeping supply in check.

> *• MSP stands for Minimum Support Price, a price set by the government for certain agricultural products.*
> *• Monetary Policy is used by RBI and Fiscal Policy is used by Government.*

LIQUIDITY

•Liquidity means how easily an asset can be converted into cash without losing its value. Money has the highest liquidity because it can be used immediately for transactions.

Liquidity Order

Cash > Gold > Cheque > Bond

Demand Deposit is more liquid than Term Deposit

Money was invented to solve the issue of barter system .

Limitations of Barter system: *Double Coincidence of Wants, Lack of Divisibility, Lack of Store of Value.*

Function of money are classified into 2 categories

•***Primary :*** *Medium of Exchange,* It can be used for buying and selling goods and services.

•***Secondary:*** *Medium of value (Unit Of Account),* It helps to measure the value of goods and services.

a) Standard of Deferred Payment

b) Store of Value: Valuable in Nature, It retains value over time, unlike perishable goods (Money has no intrinsic value, unlike commodities such as gold). Modern paper has value because of government backing.

c) Highly Portable and Durable: Money is easy to carry around and does not degrade over time.

Liquidity Preference theory (Keynesian theory of demand for money)

It states that interest rates are determined by the demand and supply of money, rather than just savings and investment.

The Cambridge Cash Balance Approach

It was developed by *Marshall, Pigou, and Keynes*

It states that the value of money is determined by the demand to hold cash balances (as a store of value) rather than just transaction velocity.

There are Three Reasons Why People Hold Money

Transaction Motive

•This is the most basic reason for holding money. Money is held to facilitate smooth spending on goods and services. ***E.g. people keep cash on hand to pay for regular purchases like groceries, transportation, or bills etc.***

Precautionary Motive:

•Precautionary motive refers to holding money to meet unexpected or emergency expenses. ***such as illness, accidents, or sudden financial needs.***

Speculative Motive (by J M Keynes)

•People hold money to take advantage of investment opportunities or avoid potential losses. ***E.g. buying stocks when the market dips, by being ready to invest when prices are considered favorable.***

The paradox of thrift

It is a *Keynesian economic theory* stating that an individual increase in savings (thrift) during an economic downturn can, collectively reduce aggregate demand and total savings in the economy. As households save more, reduced consumption lowers business revenues, leading to decreased income and ultimately less total savings.

Speculative Demand for Money

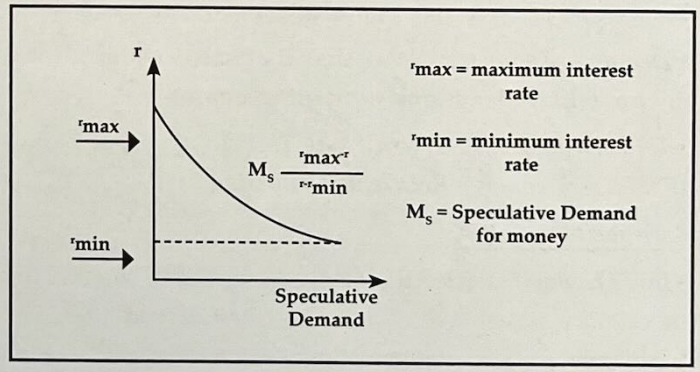
•Speculative demand for money is the ***desire to hold cash or other liquid assets*** for investment purposes, rather than for daily needs.

$$\text{Speculative Demand for Money} \propto \frac{1}{\text{Rate of Interest}}$$

•Speculative demand for money and interest rates share an inverse relationship. As interest rates rise, speculative demand for money falls, and vice versa.

•***When interest rates rise → People prefer to invest in bonds and financial assets instead of holding cash → Speculative demand for money decreases.***

•***When interest rates fall → Returns on investments are low, so people hold more cash instead of investing → Speculative demand for money increases.***

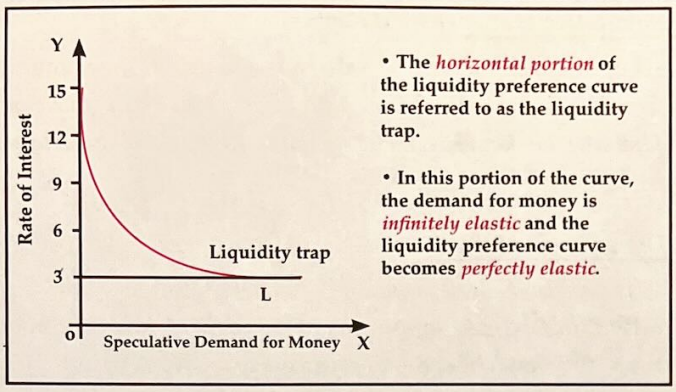


Graph 1: Speculative Demand Curve

"Interest rates are an opportunity cost or 'price' of holding money balance in an economy.

Liquidity Trap

•A liquidity trap is an economic situation *where interest rates are low and people prefer to hold cash instead of spending or investing,* which can lead to any Monetary Policy ineffective.



Graph 2: Liquidity Trap

Types of Money in our Economy

1. Currency in Circulation

• ***Currency with Banks:*** Money held by banks for daily operations.

• ***Currency with Public:*** Money available for spending by people.

$$CDR = \frac{\text{Money held by public in currency}}{\text{Money held by public in deposits}}$$

During a festival, does the Currency Deposit Ratio (CDR) increases or decreases?

2. Deposits with Banks

Banks hold two types of deposits from customers:

• ***Demand Deposits:*** Deposits that are withdrawable anytime ***(Ex: Savings and Current Accounts)***

• ***Term Deposits:*** They are fixed deposits for a set period ***(Ex: Fixed Deposits, Recurring Deposits)***.

3. Deposits with RBI

• ***Bank Deposits with RBI:*** It includes the CRR, which is the mandatory percentage of a bank's ***Net Demand and Time Liabilities (NDTL) that must be kept with the RBI***. This helps in controlling inflation and liquidity in the economy.

• ***Other Deposits with RBI:*** It includes deposits from government institutions, foreign central banks, international financial organisations and some private entities.

4. Postal Deposits

They are similar to bank deposits (Term Deposits and Demand Deposits), but managed by the ***Post Office Savings Bank (POSB)***.

MONEY AGGREGATES

• Monetary aggregates ***(or Money Supply)*** refers to the amount of money in circulation in the economy at a given time. The Reserve Bank of India (RBI) measures it using different monetary aggregates ***(M0, M1, M2, M3, M4)***.

Types of Money Supply

Money Aggregates	*Components*
M0	Currency in circulation + Banker's deposit with RBI
M1	Currency with public + Other deposits with RBI + Demand Deposits
M2	M1+ Saving deposits with Post Office savings bank
M3	M1+Net time deposits of commercial banks
M4	M3+Total deposits with Post Office

Points To Note

1. ***M0*** is called as ***High Powered Money/Base Money/ Reserve Money. It is the total Amount of Money printed by RBI.***
2. ***M1*** is called as ***Narrow Money.***
3. ***M3*** is called as ***Broad Money*** and ***Aggregate Monetary Resource.***

Liquidity order

• The rate at which banks lend to each other to meet ***short-term needs (such as fulfilling CRR requirement by RBI)*** is called the Interbank Offer Rate, also known as the ***Offer Rate.***

London Interbank Offer Rate (LIBOR)

• ***LIBOR*** served as a base rate for loans and financial products worldwide, including loans, mortgages, etc.

• It was no longer published after ***31st December 2021*** and was officially replaced with ***SOFR (Secured Overnight Financing Rate)*** for the ***US dollar***.

• The ***MIBOR (Mumbai Interbank Offer Rate)*** was the Indian version of LIBOR. MIBOR was replaced by the ***FBIL-Overnight MIBOR*** in ***2015***.

"Asia's oldest stock exchange is "Bombay Stock Exchange" established in 1875.

Money Market *(Short-term Loans for Less than 1 year)*

- *Call Money:* Loans are to be repaid within *1 day*.
- *Notice Money:* Loans are to be repaid in *2-14 days*.

Capital Market *(Long-Term Loans for More than 1 year)*

- They are used for long-term investments, including stocks and bonds.

Treasury Bills *(Issued by RBI)*

- It is also known as *Zero Coupon Securities.*
- They are short-term debt instruments issued by the *GOI through the Reserve Bank of India (RBI)*.
- *T-Bills are issued in three tenure: 91 days, 182 days, and 364 days*
- T-Bills are categorised as money market instruments because they have a *maturity of less than one year*.
- They are always listed at a discount, *no interest is paid*.

Assets

- Assets are resources owned by an individual or entity that hold economic value (reserve loan).

Types of Assets.

1. *Regular Assets:* Regular Assets are financial assets that generate consistent returns over the long term. They typically include loans where both interest and principal are repaid on time.
2. *Stressed Assets:* Stressed assets are loans that are not performing, or are in danger of not performing (when principal + interest rate is *overdue for less than 90 days)*.
3. *Non-performing Assets (NPAs):* It is a loan or advance where the interest or principal payment is *overdue for more than 90 days*.

   Classified as:

   - *Substandard Assets:* Loans that are overdue for more than *90 days but less than 12 months*.
   - *Doubtful Assets:* Loans that are overdue for *more than 12 months*.
   - *Loss Assets:* Loans that are considered uncollectible and have *no chance of recovery*.

Wilful Defaulter

A borrower who has the capacity to repay loans but deliberately chooses not to pay.

Bad Banks

- A bad bank is a financial entity which specialises in *handling bad loans or NPAs*. It buys the NPAs of commercial banks and tries to recover at least a part of the value of such NPAs.

2021 Budget announced two bad banks to help resolve NPAs:

- *National Asset Reconstruction Company Limited (NARCL)*
- *India Debt Resolution Company Limited (IDRCL)*

Banking Regulations and Security Laws

SARFAESI Act, 2002

- *Full Form: Securitisation and Reconstruction of Financial Assets and Enforcement of Securities Interest Act.*
- *Purpose:* It allows banks to seize properties of borrowers who fail to repay loans.

Insolvency and Bankruptcy Code (IBC), 2016

- *Objective:* To resolve the *Twin Balance Sheet Problem* (where banks are stressed with bad loans and corporates are stressed with debt).
- It helps in the quick resolution of *financial insolvency*, ensuring that defaulting companies repay lenders in a time-bound manner.
- It initiates the *Corporate Insolvency Resolution Process (CIRP)* for resolving insolvency of companies.
- Under *IBC, 2016*, a moratorium period *(calm period)* of *180 days* is granted when a company undergoes insolvency proceedings *(can be extended to 270 days in certain cases)*.

There are two governing bodies

National Company Law Tribunal (NCLT): Handles the initial insolvency cases.

National Company Law Appellate Tribunal (NCLAT): Handles appeals against NCLT decisions.

INTERNATIONAL BANKING REGULATIONS

Basel Norms

- The Basel Norms, also known as the Basel Accords, are a set of international banking regulations that aim to strengthen the banking system and manage risk.
- *Established by: Central Bank Governors (G-10 countries) in 1974.*
- *Headquarter: BIS (Bureau of International Settlement) office in Basel, Switzerland.*
- The *Basel Committee on Bank Supervision (BCBS)* has issued three sets of regulations which are known as *Basel-I, II, and III*.

Basel-1

- *Introduced in: 1988*
- It focused almost entirely on credit risk.

- The minimum capital requirement was fixed at ***8% of risk weighted assets (RWA)***.
- India adopted Basel-I guidelines In ***1999***.

Basel-II

- ***Introduced in:*** 2004

Capital Adequacy Ratio ***(CAR)*** Also known as ***CRAR*** (Capital to Risk (Weighted) Assets Ratio). ***It is the ratio of a bank's capital to its risk.***

$$CAR = \frac{\text{Tier1 Capital} + \text{Tier2 Capital}}{\text{Risk Weighted Assets}} \times 100$$

Basel-III

- ***Introduced in: 2010***
- A bank needs to maintain the ***capital adequacy ratío (CAR)*** is to be maintained at ***10.5%***. The minimum Tier 1 ***(Core)*** capital ratio and the minimum Tier 2 ***(Supplementary)*** capital ratio have to be maintained at 6% and 2% of risk-weighted assets respectively and The Capital Conservation Buffer (2.5%).
- India's RBI-mandated CAR is ***11.5%***

Poverty

• Poverty is a state or condition in which an individual lacks the financial resources and essentials for a basic standard of living. It can have diverse environmental, legal, social, economic, and political causes and effects.

Types of Poverty

1. ***Absolute Poverty:*** A condition where individuals lack basic necessities like food, clean water, shelter, clothing, and healthcare, and education.
2. ***Relative Poverty:*** A condition where individuals have significantly lower income or resources compared to the average income level of their society.
3. ***Subjective Poverty:*** A condition based on personal perceptions of economic well-being, where individuals feel poor, despite their income level influenced by societal comparisons, personal expectations, and psychological factors.

Poverty Estimation

Poverty Gap Index: It is used to measure the depth of poverty by accounting for the extent to which individuals fall below the poverty line.

The World Poverty Clock: It is managed by *World Data Lab*, provides real-time estimates of global poverty.

POVERTY ESTIMATION IN INDIA

• In India, poverty is measured by checking a person's income or consumption level. If their income or spending is less than a set minimum amount, they are considered *Below the Poverty Line (BPL).*

• Poverty estimation in India is carried out by *NITI Aayog's* task force through the calculation of the poverty line based on data captured by the *National Sample Survey Office* (NSSO) under the *Ministry of Statistics and Programme Implementation* (MOSPI).

Pre-Independence Estimation

• *Dadabhai Naoroji* through his book, *"Poverty and Unbritish Rule in India"* made the earliest estimation of poverty line *(₹16 to ₹35 per capita per year).*

• He was the *first person* to give estimation of *National Income of India.*

1. National Planning Committee (1938)

• It was set up by *Subash Chandra Bose* under the *chairmanship of JL Nehru.*

• The National Planning Committee (NPC) of *1938* estimated the poverty line at *₹15 to ₹20 per capita per month.*

• This estimate was based on a minimum standard of living which implicitly included nutritional requirements.

2. The Bombay Plan (1944)

• It was a set of proposals by influential business leaders in Bombay for the development of India.

• *Poverty line was suggested as: ₹75 per capita per year.*

Post-Independence Estimation

1. VM Dandekar and N Rath (1971)

• It was the first systematic assessment of poverty in India, based on *National Sample Survey Office (NSSO)* data.

• It was an *Expenditure based Poverty line estimation.*

• It is adequate to provide *2250 calories per day* in rural and urban areas.

2. Alagh Committee (1979)

• The Planning Committee constituted Alagh Committee under the chairmanship of YK Alagh.

• He constructed a poverty line for rural and urban areas on the basis of *nutritional requirements* and *related consumption expenditure.*

• *Rural: 2400 calories → Rs 49.09 per month*

• *Urban: 2100 calories → Rs 56.64 per month*

3. Lakadawala Committee (1993)

• This committee defined the poverty line on the *basis of household per capita consumption expenditure.*

• The committee used *Consumer Price Index-Industrial Workers (CPI-IW)* and *CPI-AL (Consumer Price Index for Agricultural Laborers)* for estimation of the poverty line.

It made few suggestions:

• Consumption expenditure should be calculated based on calorie consumption as earlier.

• State specific poverty lines should be constructed.

4. Tendulkar Committee (2005)

• Tendulkar Committee was *set up in 2005* to address the shortcomings of previous methods and *submitted its report in 2009.*

• It computed poverty line based on *Purchasing Power Parity* in terms to ₹33 per day.

Recommendations:

• It recommended to shift away from calorie based model and made poverty line broader.

• Incorporation of private expenditure on health and education.

• It replaced the uniform reference period (URP) with the *mixed reference period (MRP)* to estimate poverty in India.

• ***30 Days Recall:*** For food and frequent items.

• ***365 Days Recall:*** For infrequent non-food items (clothing, footwear, durables, etc.)

According to Tendulkar Committee, the poverty line for 2011-12 was set to:

• ***Rural:*** *₹816 per capita per month.*

• ***Urban:*** *₹1,000 per capita per month.*

According to Planning Commission, the % of people below poverty line is

Rural: 25.7%
Urban: 13.7%
} Overall 21.9% (2011-2012)

5. Rangaranjan Committee (2012)

• ***Rangarajan committee include three components in poverty baskets:*** *food items, essential non-food items, and behaviorally determined non-food items.*

• In addition to calories intake it also include other nutrients like protein and fat.

• It introduced *Mixed Modified Reference period* (consumption and expenditure was computed on *weekly, monthly, and yearly* basis).

The poverty line was recommended (reports submitted in 2014) as:

• ***Rural:*** *₹972 per capita per month.*

• ***Urban:*** *₹1407 per capita per month.*

Trends in Poverty Reduction

• ***2004-2005:*** *407 million* people were poor *(37.2% in BPL - Rural (41.8%) and Urban (25.7%)*

• ***2011-2012:*** *270 million* people were poor.

• ***1993-94 to 2004-2005:*** Poverty declined by *0.74%* per year.

• ***2004-2005 to 2011-2012:*** Poverty declined by *2.4%* per year.

State-wise Poverty (2011-2012)

• ***Highest Poverty Rate:*** *Chhattisgarh (39.9%), Jharkhand (37%), Bihar 33.7%)*

• ***Lowest Poverty Rate:*** *Goa (5.09%), Kerala (7.1%).*

Types of Poor

1. ***Usually Poor:*** **They are normally below Poverty line.**
2. ***Churning Poor:*** **They move in and out of poverty line.**
3. ***Occasionally Poor:*** **They are normally above poverty line.**

MULTIDIMENSIONAL POVERTY INDEX (MPI)

• The MPI concept was introduced in *2010* by *United Nations Development Programme (UNDP)* and *Oxford Poverty and Human Development Initiative (OPHI).*

• It uses *10 indicators* over *3 key dimensions*, Education and Standard of living to determine the incidence and intensity of poverty experienced by a population.

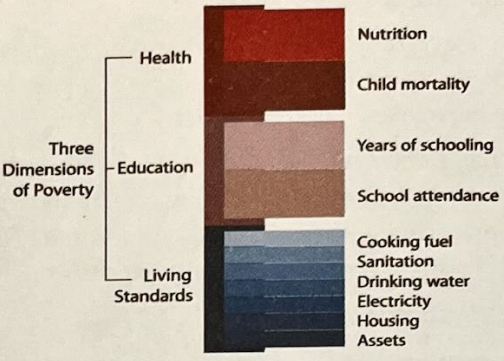


Fig 1: Structure of the Global Multidimensional Poverty Index

• ***NITI AAYOG*** launched a report in *November 2021→ National Multidimensional Poverty Index (MPI)*, that measures poverty in India using *12 indicators (Extra two indicators are antenatal care and bank account).*

In recent scenario:

• Multidimensional poverty in India has declined since *2005-2006* as measured by National MPI.

• According to the NITI Aayog, *24.82 crore* people have escaped multidimensional poverty in India in the last *9 years.*

• ***Uttar Pradesh:*** Largest number of people lifted out of poverty since 2005-2006.

→ ***Highest MPI (Most Poverty):*** *Bihar.*

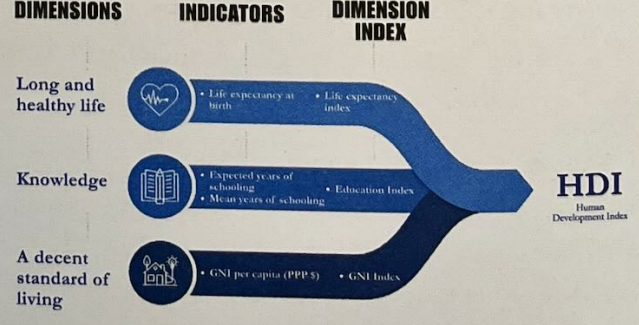
→ ***Lowest MPI (Least Poverty:*** *Kerala.*

Human Development Index:

Concept given by: Amartya Sen and Mehboob ul Haq

• It was introduced in 1990

• It is a score between 0 and 1



Head Count Ratio (HCR)

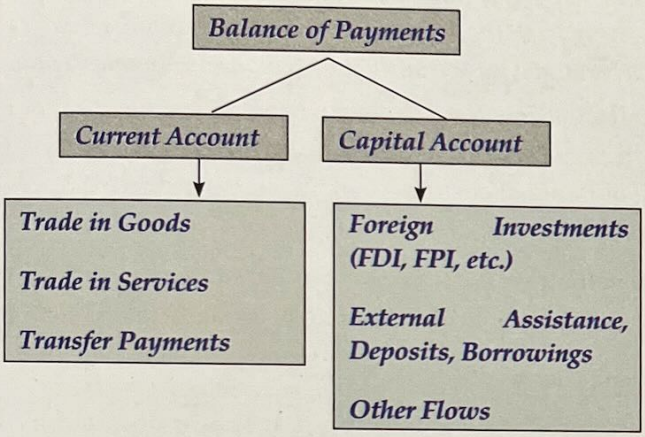
• The head count ratio (HCR) is the *percentage of a population that lives BPL*. It's also known as the poverty headcount index.

$$\text{Head Count Ratio} = \frac{\text{No. of multidimensionally poor people}}{\text{Total population}}$$

ILO basic needs approach:

6 basic Needs: Education, Food, Clothing, Shelter, Health Care, Safe Drinking Water.

BALANCE OF PAYMENT (BOP)



• The Balance of Payment (BoP) is a record of all financial transactions (imports, exports, investments) between a *country and the rest of the world over a specific period.*

• ***Types:*** *Current Account and Capital Account.*

• ***Current Account:*** This account scans all the *incoming and outgoing* of goods and services between countries. It is divided into:

- ***Visible items:*** Exports and Imports of all *physical goods* such as tea and coffee. These are *tangible* in nature.
- ***Invisible items:*** Exports and Imports of *services* such as shipping, banking, etc. They are *intangible* in nature.
- ***Transfer Payments:*** These include *unilateral transfers* such as remittances, foreign aids, etc.

→ *Top receiver of remittances globally: India.*

→ *2nd: Mexico.*

• **Capital Account:** Capital transactions like purchase and sale of assets (non-financial) like lands and properties are monitored under this account.

Types of investment included

- **Foreign Direct Investment (FDI):** It is a *long-term investment* in a *foreign country's physical asset often involving at-least 10% in equity ownership Eg. Walmart acquiring Flipkart.*
- **Foreign Institutional Investment / Foreign Portfolio Investment (FPI):** It is a *short-term investment* in a foreign country's *financial assets often involving less than 10% in equity ownership. Eg. Stocks, bonds, mutual funds, NRI deposits.*

FDI limit in defence sector was enhanced in 2020:

→ *74% through the Automatic.*

→ *Up to 100% through the Government Route.*

Current Account Deficit

• A current account deficit is when a *country imports more than it exports.*

• It includes the balance of trade, net income from abroad, foreign aid, and net current transfers.

Twin Deficit

• A twin deficit occurs when a country has both a *current account deficit* and a *fiscal deficit.*

Balance of Payment Crisis (1991)

• Balance of Payment (BoP) Crisis is also called *currency crisis.* It occurs when a nation is unable to pay for essential imports or repay its foreign debts.

• India faced BOP in *1991* (then *PM: PV Narasimha Rao* and then *Finance Minister: Manmohan Singh*). In response to this, the government introduced broad range of reforms under *LPG* model. (* *Mentioned in detail, page no 248-249*)

FOREX Exchange Reserves

• Forex Exchange Reserves are *assets held by nation's central banks or monetary authority* holds to provide import cover and protect against external shocks.

The four main components of foreign exchange reserves are:

• *Foreign Currency Assets (FCA).*

• *Gold reserves.*

• *Special Drawing Rights (SDRs)*→ also termed as *Paper gold.*

• *Reserve Tranche Position in the IMF* (required quota to be maintained within the IMF→ *Higher the quota in IMF, higher is the voting power*).

SDR Basket of Currency includes:

• *US Dollar, Euro, Yen (Japan), Yuan (China), Pound (Britain)*

International Monetary Fund (IMF) and World Bank

- *Headquarter: Washington D.C.*
- The *Bretton Woods Conference in 1944* (officially known as *United Nations Monetary and Financial Conference*) was a gathering of *44 nations with 730 delegates* which resulted in the creation of IMF and World Bank (Twin Organisations).
- Bretton Woods system collapsed in 1971 when the U.S. suspended gold convertibility.
- It also resulted in creation of *International Bank for Reconstruction and Development (IBRD)* which is now a part of World Bank.
- *India ranks 8th in voting power.*

Top Borrowers of IMF

1st: Argentina, 2nd: Egypt, 3rd: Ukraine, 4th: Pakistan, 5th: Ecuador.

The Washington Consensus is a set of 10 free-market economic policy prescriptions developed in 1989 by economist John Williamson for crisis-prone developing nations, particularly in Latin America. Promoted by the IMF, World Bank, and U.S. Treasury, it advocates for privatization, deregulation, trade liberalization, and fiscal discipline to foster growth.

IMF major reports –

- World Economic Outlook
- Global Financial Stability Report
- Fiscal Monitor
- External Sector Report

NOSTRO and VOSTRO

- A Nostro *("our")* account refers to a bank account that a domestic bank holds in a foreign bank in foreign currency →*"Our account/money in your bank"*. It is used for international transactions and trade.
- A VOSTRO *("your")* account refers to a bank account that a foreign bank holds in a domestic bank in the domestic currency → *"Your account/money in our bank"*. It allows foreign banks to conduct transactions in the domestic market.

Exchange Rate Mechanisms

FERA (Foreign Exchange Regulation Act 1973)

- It was introduced with the intent to facilitate and simplify the foreign exchange system in India. *This act was later abolished and replaced by FEMA* since its rigid regulations were hindering India's economic growth.
- Under FERA it was treated as Criminal Offence.

FEMA (Foreign Exchange Management Act 1999)

- FEMA focuses on enhancing India's foreign exchange reserves and emphasises the promotion of foreign trade and payments.
- It decriminalised the criminal offence violation into civil offence making it more user friendly.

Certain Terms to Understand

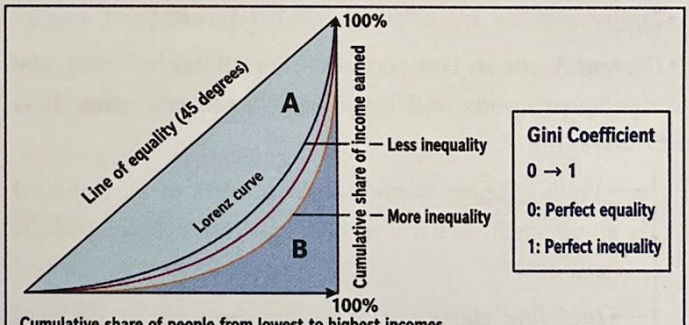
- **Depreciation:** A *decrease in the value of the domestic currency* due to market forces (supply and demand in the forex market). Exporters will benefit in case of depreciation.
- **Appreciation:** An *increase in the value of the domestic currency* due to market forces. This happens when the demand for the domestic currency rises.

"Both Depreciation and Appreciation occurs due to Floating Exchange Rate system (price of country's currency is determined by the market based on supply and demand).

- **Devaluation:** A *government-induced depreciation* of the domestic currency under a fixed exchange rate system. Devaluation of currency will be more beneficial if prices of exports rise proportionately.
- **Revaluation:** A *government-induced appreciation* of the domestic currency under a fixed exchange rate system.

Lorenz Curve

- A Lorenz curve is a graph that shows how *income or wealth is distributed within a population.* It is used to measure inequality and to compare the distribution of income and wealth across different age groups.



**Gini Coefficient or Gini Ratio can be associated with measurement of income inequality in an economy.*

Graph 1: Lorenz Curve

A fixed currency rate is often called pegged currency rate.

Convertibility of Rupee

It means the freedom to convert Indian Rupee into foreign currency and vice-versa for international transactions.

• ***Current Account Convertibility:***

Freedom to convert rupee for trade transactions (imports, exports, remittances, travel, etc.)

India adopted full current account convertibility in 1994 under IMF Article VIII.

• ***Capital Account Convertibility:***

Freedom to convert rupee for capital transactions such as foreign investment, loans, and purchase of assets abroad.

In India it is partially convertible and regulated by the Reserve Bank of India.

Tarapore Committee

It was constituted in ***1997***, reviewed again in ***2006***, constituted by the ***Reserve Bank of India*** under the chairmanship of ***S. S. Tarapore***, examined the feasibility of introducing ***Capital Account Convertibility (CAC)*** in India and recommended a phased roadmap for allowing free cross-border movement of capital, subject to key macroeconomic preconditions such as ***low fiscal deficit, controlled inflation, strong banking sector with low NPAs, and a stable financial system,*** so that the economy could integrate with global financial markets without exposing itself to excessive external vulnerability.

Exchange Rate System in India

Evolution of Exchange Rate Regime in India

• ***1928–1948:*** Indian Rupee pegged to British Pound Sterling.

• ***Post-1948 (IMF System):*** Rupee pegged to US Dollar under Fixed Exchange Rate System (value fixed by government).

• ***1975:*** India delinked Rupee from Pound Sterling.

• ***1992:*** Introduction of LERMS (Liberalised Exchange Rate Management System) – Dual exchange rate system (partly government controlled and partly market determined).

• ***1993:*** India adopted a Market Determined / Floating Exchange Rate System where demand and supply decide the value of Rupee.

Exchange Rate Indices

NEER (Nominal Effective Exchange Rate):

Weighted average of the domestic currency against a basket of foreign currencies based on trade weights; does not adjust for inflation.

REER (Real Effective Exchange Rate):

NEER adjusted for inflation (price differential); shows the real external value or competitiveness of the currency.

Types of Currency

• ***Hard Currency:*** A stable and widely accepted currency with strong value in international trade (e.g., USD, Euro).

• ***Soft Currency:*** A weak and unstable currency that is not widely accepted globally.

• ***Hot Currency:*** Currency that moves quickly between countries for short-term profit due to interest rate or exchange rate changes.

• ***Heated Currency:*** Currency under heavy demand or speculation in the foreign exchange market.

• ***Cheap Currency:*** A currency whose value has depreciated (low exchange value) compared to others.

• ***Dear Currency:*** A currency whose value has appreciated (high exchange value) compared to others.

Base Erosion and Profit Shifting (BEPS)

Base Erosion: Establishing shell companies in different jurisdiction to break audit trail and separate the money from source.This involves reducing the level of taxable profits within a specific high-tax jurisdiction.

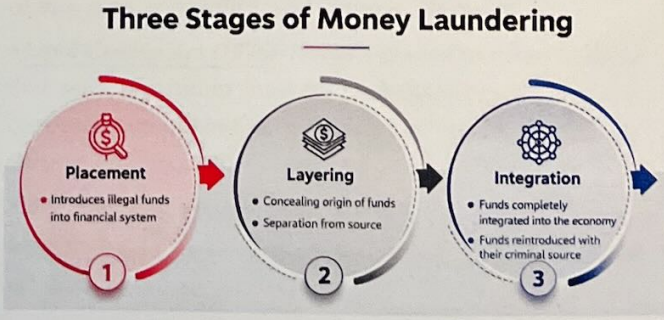
Profit Shifting: This is the actual movement of those "eroded" profits from a high-tax jurisdiction to a low or no-tax jurisdiction, such as the Cayman Islands or Bahamas, where there is little to no actual economic activity.

Round Tripping:

Round tripping refers to the process where domestic black money is sent abroad and then brought back into the country as foreign investment (FDI) through shell companies or tax havens to make it appear legitimate.

FATF (Financial Action Task Force)

HQ: Paris, France
Founded: July,1989 [G7]
Sets global standards to combat money laundering,terrorist financing.



Shell Company

A shell company is a corporate entity that exists only on paper with little or no real business operations, often used to hold assets, route funds, or conceal the real ownership of money.

Minimum Alternate Tax (MAT)

- It is a provision under Section 115JB of the Income Tax Act, 1961, ensuring companies that claim high exemptions/ incentives still pay a minimum tax. It applies when the normal tax liability is less than 15% of their book profit (plus surcharge/cess).
- ***Concept:*** Companies sometimes reduce taxable income using incentives (like depreciation, SEZ benefits, etc.). MAT ensures they pay at least a minimum tax based on "book profit" (profit as per financial statements), not just taxable income.
- ***Applicability:*** Applies to all domestic and foreign companies.
- ***Calculation:*** Book profit is calculated according to the Companies Act 2013.
- ***Purpose:*** To prevent "zero-tax" companies from avoiding tax, even if they are profitable.

FIVE-YEAR PLANS

Pre-Independence

The Visvesvaraya Plan (1934)

- *India's earliest blueprint for planned economic development,* focusing on industrial growth and state-guided planning to rapidly increase national income.
- It formally titled *Planned Economy for India 1934*, was the *first* systematic economic planning proposal for India before independence.

National Planning Committee (1938)

- It was formed by *S.C. Bose.*
- *1st Chairman: J.L. Nehru.*
- It was the first attempt to develop a National Plan for India.

Bombay Plan (1944)

- *"A Plan of Economic Development for India"* → popularly known as Bombay Plan. It was prepared by India's leading capitalists like J.R.D Tata.
- It was published in two parts: First part *(released in 1944)* and Second part *(released in 1945).*

Gandhian Plan (1944)

- The plan emphasized on *"decentralised economic structure"* for India with *"self-contained villages".*

Peoples Plan (1945)

- It was formulated by M.N. Roy, Chairman of the *Post-War Reconstruction Committee of Indian Trade Union.*

Sarvodaya Plan (1950)

- It was formulated by *Jaiprakash Narayan* (formed Congress Socialist Party in 1934). It was a sort of the *first blueprint* of the planned development of Independent India.

Post-Independence (1947)

- The concept of five-year plans was borrowed from the *USSR* (The Union of Soviet Socialist Republics) → *Joseph Stalin* introduced it in *1928* to industrialize the Soviet Union.

Introduction in India

- The Planning Commission of India was set up in *1950* that prepared the Five-Year Plan.

Pranab Mukherjee served as the Vice Chairman of Planning Commission.

The goals of the five year plans were:

1. *Growth:* Growth in terms of GDP.
2. *Modernisation:* Integration of new technology in the economy.
3. *Self-reliance:* Inward-looking trade strategy (domestic production instead of importing goods).
4. *Equity:* Development of all.

- The Five-Year Plans not only specify the objectives to be attained in the 5 years of a plan but also what is to be achieved over a period of *20 years*. This long-term plan is called *"perspective plan".*

During Independence, about 75% of the country's population was dependent on agriculture.

First Five-Year Plan (1st April 1951)

- *At independence, India was largely agricultural. The industrial sector contributed only 13% to GDP in 1950–51.*

- *Target Growth Rate: 2.1%*
- *Achieved: 3.6% (Successful)*

- *Duration: 1951-1956.*
- *Based on: Harrod-Domar Model.*
- *Key Focus:* Agriculture and Rural Development (Primary Sector).
- It was presented by *India's first PM→JL Nehru.*

Major Irrigation Projects

- *Bhakra Nangal Dam (Sutlej River)*
- *Hirakud Dam (Mahanadi River)*
- *5 IITs were also established (IIT Kharagpur (1951) was first IIT to be established).*
- *Nagarjuna Sagar Dam (Krishna River)*

Reforms Introduced in Agriculture

- *Policy of "land of tiller"*: It was a land reform that gave land ownership to farmers who actually worked on it, instead of landlords. It aimed to end the zamindari system, reduce rural inequality, and empower farmers.
- *Land Ceiling Act (1976)*: It was a land reform law in India that set a maximum limit on land ownership to prevent concentration of land in the hands of a few and distribute surplus land to landless farmers.
- *High yielding variety (HYV) seeds.*
- *1952 - Community Development Program* for overall *rural development.*

Second Five-Year Plan

(Then PM: JL Nehru)

- *Duration: 1956-1961.*
- *Based on: P.C. Mahalanobis Model.*
- *Key Focus:* Development of basic and heavy industries → It stressed more on *Rapid industrialisation.*
- The *Industrial Policy Resolution of 1956 (2nd IPR) served as the foundational policy* for India's Second Five Year Plan.
- It was criticized for heavy dependence on foreign loans for *machinery imports by BR Shenoy.*
- *SSI (Small scale industries)* were given protections, incentives in this plan.

- *Target Growth Rate: 4.5%*
- *Achieved: 4.3%*
- *(Moderately Successful)*

About P.C. Mahalanobis

- *He is considered as Chief Architect of Indian Planning.*
- *On his Birth Anniversary → 29 June, Statistics Day is celebrated.*
- *Founded: Indian Statistical Institute, Kolkata*
- *He started a journal name Sankhya.*

Planning in the real sense in India began with the 2nd Five Year Plan (1956-1961)

Three Steel Plants were setup:

- *Rourkela Steel Plant (RSP): Odisha (with German collaboration).*
- *Durgapur Steel Plant (DSP): West Bengal (with British collaboration).*
- *Bhilai Steel Plant (BSP) Chhattisgarh (with USSR collaboration).*

1st steel plant of India: TISCO (Jamshedpur, Jharkhand.

Third Five-Year Plan

- *Duration: 1961-1966.*
- *Based on: Gadgil Formula.*
- *Primary objective: Allocation of central assistance for state plans*
- *Key Focus:* Self-reliant and self-generating economy.
- *Reasons for its failure: Sino-Indian War (1962),* followed by the *Indo-Pakistan War (1965)* → diverted the focus towards defense spending, alongside *severe droughts* during the plan period.
- *PL 480 Scheme:* India imported wheat from the USA under this scheme to alleviate hunger and poverty.

- *Target Growth Rate: 5.6%*
- *Achieved: 2.8% (Failure)*

Lal Bahadur Shastri was the PM of India during Indo-Pak War. He raised the slogan "Jai Jawan Jai Kisan" when India went to war with Pakistan.

Establishment of Various Institutes

- *Food Corporation of India (FCI): 14th January 1965.*
- *Commission for Agricultural Costs & Prices (CACP): 1st January 1965.*
- *Industrial Development Bank of India (IDBI): 1st July 1964.*
- *Unit Trust of India (UTT): 1963 (by an Act of Parliament)→ Established in 1st February 1964.*

Plan Holiday

- *A break in Five-Year: 1966-1969* → due to economic strain caused by the war and other factors like severe drought.
- India focused on *"New Agriculture Strategy"* or *"Green Revolution"* → widespread distribution and *adoption of HYV seeds.*
  - *1st phase (Mid 1960s-1970s).*
  - *2nd phase (Mid 1970s).*

1971: Bangladesh Liberation War

Fourth Five-Year Plan *(Then PM: Indira Gandhi)*

- *Duration: 1969-1974.*
- *Based on: Gadgil Formula/Rudra-Allen Model.*
- *Key Focus:* Growth with stability and the move toward self-reliance.

- *Target Growth Rate: 5.6%*
- *Achieved: 3.3% (Failure)*

Key Initiatives

- Family Planning Programme was introduced.
- 14 major banks were nationalised *(1969).*
- *The Monopolies and Restrictive Trade Practices (MRTP) Act, 1969,* was implemented.
- First Underground Nuclear Test conducted–
  - *PM: Indira Gandhi*
  - *President: V. V. Giri*

→*"Smiling Buddha" (1974).*

- Drought Prone Area Programme *(1973-1974).*

Fifth Five-Year Plan *(Then PM: Indira Gandhi)*

- *Duration: 1974-1978.*
- *Based on: D. P. Dhar Model.*

- *Target Growth Rate: 4.4%*
- *Achieved: 4.8%*
- *(Moderately successful)*

Key Focus

- Employment and Poverty alleviation *("Garibi Hatao" slogan given by Indira Gandhi)*
- Attainment of self-reliance.
- *Minimum Needs Programme (1974)* was introduced which aimed to provide basic needs to poor and unreserved.

• *20 points programme (1975)* was launched that aimed to reduce poverty and improve quality of life.

• Regional Rural Banks (RRBs) were set up *(1975)*.

• *Hill Area Development Programme* was initiated.

Rolling Plan

• It was introduced by *Janata Party/Morarji Desai* government.

• Duration: *1978-1980*.

Key Focus

• Increase in the country's GDP, employment and agricultural production.

Sixth Five-Year Plan *(Then PM: Indira Gandhi)*

• *Duration: 1980-1985.*

- *Target Growth Rate: 5.2%*
- *Achieved: 5.7% (Successful)*

Key Focus

• Increase in National Income.

• Modernisation of technology.

• Decrease in poverty and unemployment (schemes for transferring skills *(TRYSEM→Training Rural Youth for Self-Employment)* and seets *(IRDP → Integrated Rural Development Programme)* and providing slack season employment *(NREP→ National Rural Employment Program)*.

• Establishment of *NABARD* (National Bank for Agriculture and Rural Development) in *1982*.

• *Rural Landless Labour Employment Guarantee Programme (RLEGP)* was launched on *15 August 1983*.

Hindu Rate of Growth (1978) → signifying low economic growth.

• *Concept given by: Prof. Raj Krishna*.

• From 1960-1980, India has experienced a slow economic growth rate.

Seventh Five-Year Plan *(Then PM: Rajiv Gandhi)*

• *Duration: 1985-1990.*

- *Target Growth Rate: 5%*
- *Achieved: 6% (Successful)*

Key Focus (FWP)

• Accelerating food grain production → *Food*.

• Generating employment opportunities → *Work*.

• Increasing economic productivity through "Social Justice" → *Productivity*.

• *Jawahar Rozgar Yojana* was introduced in *1989* by merging *NREP* (National Rural Employment Programme) and *RLEGP* (Rural Landless Employment Guarantee Programme).

• *Small and Cottage Industries* received major attention for creating jobs.

Annual Plans *(1990-1992)*

Department of Biotechnology was set up by GOI in Seventh FYP.

• *No Five-Year Plan* due to political uncertainty

• *Balance of Payments (BoP) Crisis (1991)* that led to beginning of ***L*** (Liberalisation), ***P*** (Privatisation) and ***G*** (Globalisation) reforms.

Eight Five-Year Plan (Then PM: PV Narasimha Rao)

• *Duration: 1992-1997.*

Key Focus

- *Target Growth Rate: 5.6%*
- *Achieved: 6.8%*
- *(Highly Successful)*

• The 8th FYP initiated the structural adjustment policy

.

• New Indicative Policy.

• Economic and Fiscal reforms were seen.

• Share of Public sector declined (License Raj ended).

• It focused on Human Development.

• Sector for focus for employment generation : Horticulture, Animal Husbandry, Fishery, Small scale industries.

*The Eighth FYP could not take off in 1990 due to the fast changing political situation at the Centre and the years 1990-91 and 1991-92 were treated as **Annual Plans**. The Eighth Plan was finally launched in 1992 after the initiation of **structural adjustment policies**.*

Some 65% of the country's population continued to be employed in agriculture even as late as 1990. Between 1950 and 1990, GDP contributed by agriculture declined significantly but not the population depending on it (67.5% 1950 to 64.9% by 1990).

Ninth Five-Year Plan *(Then PM: Atal Bihari Vajpayee)*

• *Duration: 1997-2002.*

- *Target Growth Rate: 6.5%*
- *Achieved: 5.4% (Failure)*

Key Focus

• Growth with social justice and equality.

• After 9th Five-Year Plan, there was not much focus on public sector.

• Pokhran II - Operation Shakti (May1998)

Tenth Five-Year Plan *(by Atal Bihari Vajpayee and Manmohan Singh)*

- *Target Growth Rate: 8%*
- *Achieved: 7.6% (Failure)*

- *Duration: 2002-2007.*
- *National Horticulture Mission (NHM)* was promoted by government.
- *Jute Technology Mission* was introduced.
- Introduction of *Micro Irrigation Programme.*

Eleventh Five-Year Plan

- *Target Growth Rate: 9%*
- *Achieved: 8% (Failure)*

- *Duration: 2007-2012.*

Key Focus

- Towards rapid and more inclusive growth.
- Global financial crisis overlapped with the Five-Year Plans.

Twelfth Five-Year Plan *(Then PM: Manmohan Singh)*

- *Duration: 2012-2017.*
- *Key Focus:* Towards faster, more inclusive and sustainable growth.

- *Target growth: 8%*

NITI AAYOG

NITI AAYOG chairman: Prime Minister of India.

- In *2014,* the Planning Commission was replaced with NITI AAYOG and Five-Year Plans were discontinued.
- NITI AAYOG (non-constitutional body) was set up on: *1st Jan 2015.*
- It is a *policy think tank for the GOI.*
- It designs and recommends policies and programs for India's development.
- It publishes reports on a variety of topics, including fiscal health, education quality, and water management.

(NITI* = National Institution for Transforming India)

INDUSTRIAL POLICY RESOLUTION (IPR)

- Industrial Policy Resolutions (IFRs) are policy frameworks set by the Indian government to regulate industrial growth, define the role of the public and private sectors, and promote economic development.

1st IPR, 1948

- *First official industrial policy of independent India.*
- *Led by: Dr. Shyama Prasad Mukherjee* (Industry & Commerce Minister).
- It declared the Indian economy as *Mixed Economy.*

Industries were divided industries into 4 categories:

1. ***Strategic Industries (Public Sector):*** Railways, defense, atomic energy.
2. ***Basic/Key Industries (Public-Cum-Private Sector):*** Coal, steel, aircraft, telecommunications.
3. ***Industries Requiring Regulation and Control (Controlled Private Sector):*** Sugar, cement, textiles.
4. ***Other Industries (Private and Cooperative Sector):*** Consumer goods and small-scale industries.

- The *start of License Raj* → Government control over industries through licensing.
- It laid the foundation for public sector dominance in key industries.

** The Karve Committee, also known as the Village and Small-Scale Industries Committee, was established by India's Planning Commission in 1955 under the chairmanship of Dattatreya Gopal Karve. It aimed to promote rural industrialization, employment, and balanced economic growth during the Second Five-Year Plan by supporting small-scale industries and local, labour-intensive production.*

2nd IPR, 1956

- It also known as the *"Economic Constitution of India".*
- Main Objective of Industrial Policy of 1956 was *growth with equity.*
- It is a framework for socialist industrial growth in India.

Commanding Heights Doctrine (coined by Vladimir Lenin in 1922)

It refers to the state of complete control over the vital industries (such as *heavy industries, mining* and *infrastructure*) and it was adopted.

Divided industries into three schedules

- *Schedule A (17 Industries-Public Sector Monopoly)* → Aviation, Atomic energy, Railways, Arms and Ammunition, Steel and Iron etc.
- *Schedule B (12 Industries - Public & Private Sectors)*→ Aluminium, Machine tools, Chemicals etc.
- *Schedule C (All Other Industries-Private Sector)* → Consumer goods, Textiles, Automobiles etc.

Evolution of IPR policy 1956 led to formation of Maharatna companies.

Classifications of Central Public Sector Enterprises (CPSEs) in India

Maharatna Companies (Total-14)

Definition: The highest status, given to large CPSEs with significant global presence.

Criteria: Must have Navratna status, be listed on Indian stock exchanges, and have a 3-year average annual turnover of ₹25,000+ crore, net worth of ₹15,000+ crore, and net profit of ₹5,000+ crore.

- They can invest up to ₹5,000 crore or 15% of their net worth in a single project without government approval.

Examples: NTPC, BHEL, HAL

Navratna Companies (Total-26)

Definition: Mid-sized CPSEs with competitive advantages.
Criteria: Must be a Miniratna Category I or Schedule A company and have a 'Navratna' score of 60 or more (out of 100)

Autonomy: Can invest up to ₹1,000 crore or 15% of their net worth without government approval.

Examples: BEL, Engineers India Limited

Miniratna Companies (Total approx.-73)

Definition: Smaller, profitable CPSEs.
Category I: Made profit for the last 3 years consecutively or a pre-tax profit of ₹30 crore or more in at least one of the three years.

Category II: Made profits for the last 3 years continuously and have a positive net worth.

Examples: Airport Authority of India, Bharat Dynamics Limited

3rd IPR. 1977 *(extension of 1956 Policy)*

- Introduced by *Morarji Desai* Government (Janata Party).

Key Features

- It emphasised growth of *Small-Scale Industries (SSI)*.
- Introduced the *"Tiny Unit"* concept → Small enterprises with investments below *₹1 lakh*.
- Restrictions on *Multinational Corporations (MNCs)*→ Focus on self-reliance.

4th IPR. 1980

- It was introduced by *Indira Gandhi* Government.

Key Features

- Shifted focus back to heavy industries.
- Encouraged foreign technology transfer and investment → *FERA Act of 1973*.
- *Monopolistic and Restrictive Trade Practices (MRTP) Act, 1969* was amended to remove the threshold limits of assets in respect to MRTP companies.
- Investment limit for tiny unit increased to *₹2 lakhs*.

Industrial Policy Resolution (IPR), 1991 – Economic Liberalisation

Background

The Industrial Policy, 1991 marked a structural shift in *India's economy from an inward-looking (closed) system* to an outward-oriented (open) economy.

It was introduced under *P. V. Narasimha Rao*, with reforms led by *Dr. Manmohan Singh*, during the 1991 *Balance of Payments crisis*.

Economic Orientation: Before vs After 1991

Before 1991 – Inward-Looking Economy

An inward-looking strategy, is a trade and economic policy that prioritizes domestic production over foreign imports to achieve self-reliance. It involves high tariffs, quotas, and subsidies to protect local industries from international competition. It often leads to inefficiencies and lack of innovation.

- *License Raj* (strict government control)
- *Public Sector Dominance*
- *High import barriers* (tariffs & quotas)
- *Restricted FDI*
- Import substitution strategy
- *Result:* Low competition, inefficiency, slow growth

1991 Reforms – Transition (LPG Model)

Liberalisation: Refers to the reduction of government regulations, licenses, and restrictions on industrial growth and international trade, thereby freeing up markets.

Privatisation: Involves shifting ownership or management of government-owned enterprises (public sector units) to private entities, enhancing efficiency/competitiveness and reducing state burden.

To implement the privatization objective of the 1991 LPG reforms, the government later established DIPAM (Department of Investment and Public Asset Management, earlier known as the Department of Disinvestment) under the Ministry of Finance to manage disinvestment and reduce government ownership in Public Sector Enterprises.

Types of disinvestment

Minority Disinvestment: The government retains a majority stake (usually > 51%) and management control, selling only a small portion to public/institutional investors.

Majority Disinvestment: The government reduces its stake below 51%,giving majority control to private or other entities.

Strategic Disinvestment: The sale of a substantial portion of government shareholding (often 50% or more) along with the transfer of management control to a private entity.

Complete Privatization (Full Exit): A type of strategic sale where the government sells 100% of its equity, fully exiting the enterprise.

Globalisation: Integrates the national economy with the global economy through increased trade, foreign investment (FDI), and free movement of goods and technology across borders

Key Measures

- End of License Raj (except few industries)
- Disinvestment in PSUs
- FDI liberalisation (automatic route)
- Reduction in public sector monopoly
- Greater role of market forces

Important Macroeconomic Reforms

- ***Rupee Devaluation (1991) in two stages:*** 9% (July 1) + 11% (July 2)
- Fiscal Deficit (1990–91): ~10% of GDP
- Anti-Dumping Duty: Protects domestic industries
- HDFC Bank – First private sector bank after liberalisation

After 1991 – Outward-Oriented Economy

Outcomes:

Increase in FDI inflows (major benefit of FDI for developing countries like India - Access to technology and employment).

Growth of private sector

- Rise in competition and efficiency.
- India moved from Import Substitution Industrialization.
- (ISI) to Export-Oriented Industrialization (EOI)
- Global economic integration.
- Flow of capital, technology, and services.
- Emergence of BPO (Business Process Outsourcing) sector.
- India adopted Managed floating exchange rate.

Structural Changes in Economy:-

India's service sector became the primary driver of GDP, with its share rising from around 39% in 1991-92 to over 55-60% in recent years.

Share of agriculture in India's GDP has experienced a steady, long-term decline, dropping from nearly 30% in 1990-91 to around 15–18% in recent years.

Manufacturing sector share in GDP has largely stagnated.

Joint Sector

- Joint Sector refers to a form of partnership between the public sector (government) and the private sector.
- *Dutta Committee (1973)* recommended the establishment of Joint *Venture Sector* in Indian Industry.

INDICES

Financial and Development Indices

Financial Inclusion Index (FI-Index)

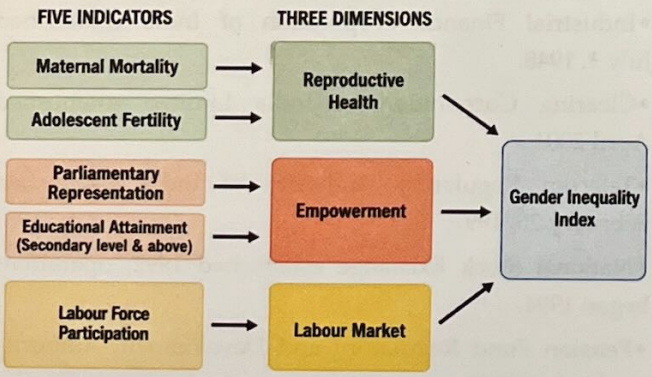
- ***Published by:*** Reserve Bank of India (RBI)
- ***Frequency:*** Annual (released in July)
- ***Purpose:*** Measures progress across three parameters: Access (35%), Usage (45%), and Quality (20%).
- ***Score Range:*** 0 = Complete financial exclusion; 100 = Full financial inclusion.

Fiscal Health Index (FHI)

- ***Published by:*** NITI Aayog.
- ***Purpose:*** Evaluates fiscal health of Indian states and promote transparency in state finances.
- ***Data Source:*** Comptroller and Auditor General of India (CAG)
- ***Key Indicators:*** Quality of expenditure, revenue mobilization, fiscal prudence, debt index, fiscal sustainability.

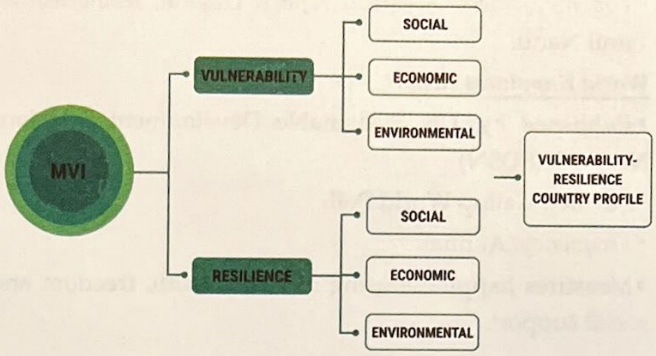
Gender inequality index

- It is Published by ***UNDP***
- It measures gender disparities across ***three*** dimensions: reproductive ***health, empowerment, and labour market participation.***
- Lesser the value of GII= Better the performance.



Multidimensional Vulnerability Index (MVI)

- ***Launched by:*** United Nations General Assembly.
- ***Year:*** August 2024
- ***Purpose:*** Measures structural vulnerability and lack of resilience in developing countries, especially Small Island Developing States.



India Innovation Index

- ***Published by:*** NITI Aayog.
- ***Purpose:*** Evaluates innovation ecosystem of Indian states and Union Territories and promotes competitive federalism.

Environmental Performance Index (EPI)

- ***Published by:*** Yale University and Columbia University.
- ***Partner:*** World Economic Forum (WEF)
- ***Frequency:*** Biennial.
- ***Purpose:*** Measures environmental health and ecosystem vitality and tracks progress toward Sustainable Development Goals.

Corruption Perception Index (CPI)

- ***Published by:*** Transparency International.
- ***Frequency:*** Annual.
- ***Scale:*** 0 = Highly corrupt; 100 = Very clean.
- Ranks countries based on perceived public sector corruption.

World Competitiveness Index

- ***Published by:*** International Institute for Management Development (IMD)
- ***Frequency:*** Annual.
- Measures global economic competitiveness.

World Press Freedom Index

- ***Published by:*** Reporters Without Borders (RSF)
- ***Frequency:*** Annual.
- Measures the level of press freedom worldwide.

School Education Quality Index (SEQI)

- ***Published by:*** NITI Aayog.
- ***First released:*** September 2019.
- Evaluates state performance in school education.

Export Preparedness Index (EPI)

- ***Published by:*** NITI Aayog.
- ***Launched:*** August 2020.
- Ranks Indian states based on export readiness.

• *Top performers in initial report:* Gujarat, Maharashtra, Tamil Nadu.

World Happiness Report

• *Published by:* UN Sustainable Development Solutions Network (SDSN)

• *Partner:* Gallup World Poll.

• *Frequency:* Annual.

• Measures happiness using income, health, freedom and social support.

MAJOR ECONOMIC REPORTS

Reports published by MoSPI

• Periodic Labour Force Survey (PLFS) by National Statistical Office (NSO)

• Monthly Infrastructure Performance Review.

Reports published by RBI

• Financial Stability Report.

• Handbook of Statistics on Indian Economy.

Global Gender Gap Report

• Published by World Economic Forum (WEF)

International Economic Institutions and Agreements

World Trade Organization (WTO)

A global organization that regulates international trade and promotes rules - based trade among nations.

General Agreement on Tariffs and Trade (GATT)

• Signed in 1947.

• Reduced tariffs and trade barriers

• Replaced by WTO in 1995

General Agreement on Trade in Services (GATS)

• Extends global trade rules to services

• *Four modes:* cross-border supply, consumption abroad, commercial presence, movement of natural persons.

Agreement on Agriculture (AoA)

• Effective from 1995 (WTO Agreement)

• *Objective:* *Reduce trade-distorting agricultural subsidies*

Types of Subsidies:

1. Green Box *2. Blue Box* *3. Amber Box*

Trade Protection Measures

• Anti-dumping duty imposed on imports priced below normal value.

• Countervailing duty imposed to offset export subsidies.

Major Government Initiatives

• Startup India launched in 2016 under DPIIT.

• Mission Antyodaya adopted in Union Budget 2017-18.

• PAT scheme launched in 2012 by Bureau of Energy Efficiency.

• Make in India launched September 25, 2014.

• POSHAN Abhiyaan launched March 8, 2018.

• Service Exports from India Scheme operated 2015–2020.

Infrastructure Initiatives

• National Infrastructure Pipeline launched in 2020.

• Sagarmala Programme launched in 2015.

• Bharatmala Pariyojana launched in 2017.

Sectoral Missions

• National Technical Textiles Mission launched in 2020 by Ministry of Textiles.

• *Budget:* ₹1480 crore till 2025–26.

Financial Platforms

• Trade Receivables Discounting System (TReDS) helps MSMEs discount invoices and access quick liquidity.

Financial and Regulatory Institutions

• Industrial Finance Corporation of India established July 1, 1948.

• Clearing Corporation of India Limited established April 2001.

• Telecom Regulatory Authority of India established February 20, 1997.

• National Stock Exchange established 1992; operations began 1994.

• Pension Fund Regulatory and Development Authority established 2003.

Investment and Real Estate Regulation

• Foreign Investment Promotion Board established 1991 and abolished May 24, 2017.

• FDI approvals now processed through Foreign Investment Facilitation Portal under DPIIT.

• Real Estate (Regulation and Development) Act enacted in 2016.

Public–Private Partnership (PPP)

A long-term contract between government and private sector to deliver public assets or services while sharing risks.

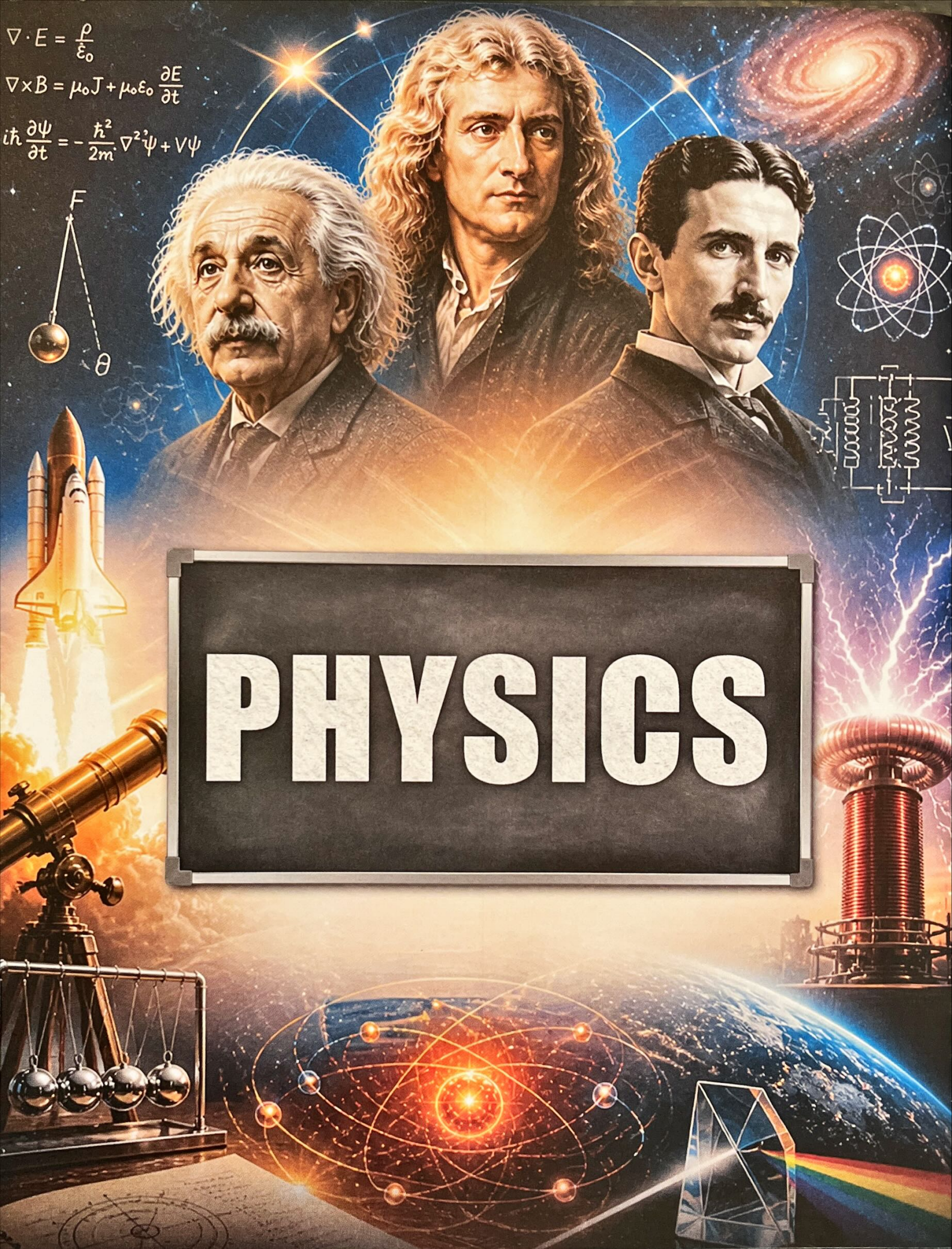
- Examples include Eastern Peripheral Expressway, Delhi–Meerut Expressway and Chenani–Nashri Tunnel.

Types of Projects

- *Greenfield:* new infrastructure built on unused land
- *Brownfield:* upgrading or renovating existing infrastructure

ECONOMIC COMMITTEES

- Raja Chelliah Committee recommended reforms in central taxation.
- Kelkar Committee (2002–03) recommended simplification of direct taxes.
- Kelkar Committee (2015) recommended reforms in PPP framework.
- R. N. Malhotra Committee (1993) recommended insurance sector reforms.
- Deepak Parekh Committee (2008) focused on affordable housing.


$\nabla \cdot E = \frac{\rho}{\varepsilon_0}$
$\nabla \times B = \mu_0 J + \mu_0 \varepsilon_0 \frac{\partial E}{\partial t}$
$i\hbar \frac{\partial \psi}{\partial t} = -\frac{\hbar^2}{2m} \nabla^2 \psi + V\psi$
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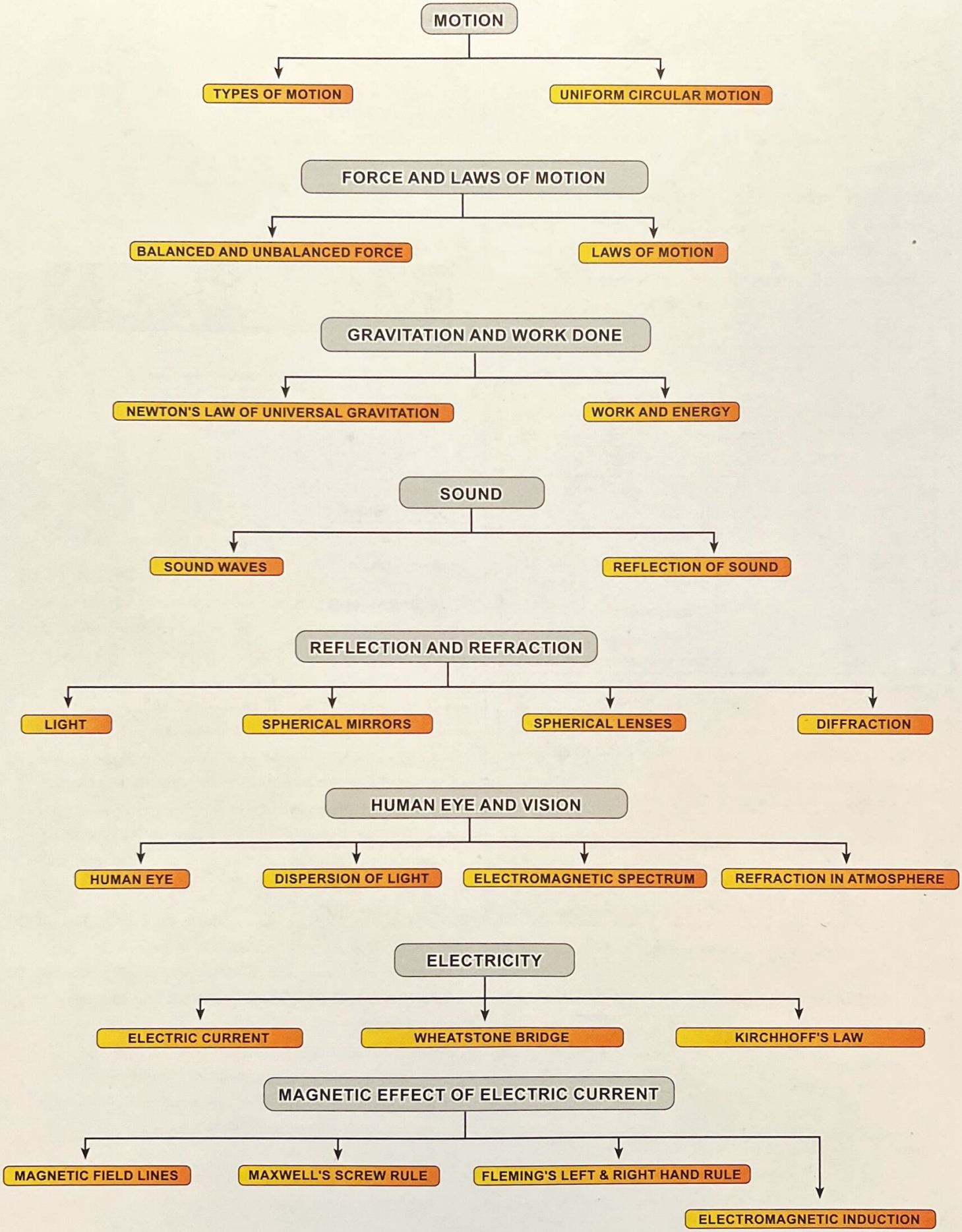
PHYSICS


MOTION
TYPES OF MOTION
UNIFORM CIRCULAR MOTION
FORCE AND LAWS OF MOTION
BALANCED AND UNBALANCED FORCE
LAWS OF MOTION
GRAVITATION AND WORK DONE
NEWTON'S LAW OF UNIVERSAL GRAVITATION
WORK AND ENERGY
SOUND
SOUND WAVES
REFLECTION OF SOUND
REFLECTION AND REFRACTION
LIGHT
SPHERICAL MIRRORS
SPHERICAL LENSES
DIFFRACTION
HUMAN EYE AND VISION
HUMAN EYE
DISPERSION OF LIGHT
ELECTROMAGNETIC SPECTRUM
REFRACTION IN ATMOSPHERE
ELECTRICITY
ELECTRIC CURRENT
WHEATSTONE BRIDGE
KIRCHHOFF'S LAW
MAGNETIC EFFECT OF ELECTRIC CURRENT
MAGNETIC FIELD LINES
MAXWELL'S SCREW RULE
FLEMING'S LEFT & RIGHT HAND RULE
ELECTROMAGNETIC INDUCTION

MOTION

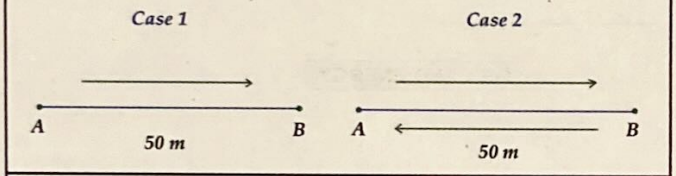
• A relative change in the position of an object with respect to a reference point is called motion.

• ***Opposite of Motion:*** ***Rest*** (when the body is still and not moving).

Motion is mainly described in the following terms:

Distance: It refers to the total length of the path an object travels, regardless of direction and is a ***scalar quantity***.

Displacement: It is the shortest path between the initial and final positions (not the total distance) and is a ***vector quantity***.



A person walks directly from point A to point B. Distance covered = 50 m. Displacement = 50 m. The person walks in a straight line.	A person walks directly from point A to point B and returns to point A. Distance covered = 100 m (50 m to B + 50 m back to A). Displacement = 0 m. The displacement is only from initial to final position.

Scalar Quantity	*Vector Quantity*
It only represents numerical value (magnitude).	It represents both numerical value (magnitude) and direction.
E.g. Distance, Speed, Time.	*E.g. Displacement, Velocity.*

Point To Remember

$km/hr \times \frac{5}{18} = m/s$

$m/s \times \frac{18}{5} = km/hr$

International system of units (S.I.) was established in 1960.

Speed: It is the rate at which an object's position changes with time, regardless of the direction of motion. Its S.I. unit is meter per second → (***m/s***) and is a ***scalar quantity***.

Average Speed

• The average speed is the ratio of total distance travelled by the object to the total time taken to cover that distance. It is a ***scalar quantity***.

$$\text{Average Speed} = \frac{\text{Total Distance Covered}}{\text{Total Time Taken}}$$

Questionnaire

An object travels 16 m in 4 sec and then another 16 m in 2 sec. What is the average speed of the object?

Sol:

$$\text{Average Speed} = \frac{\text{Total Distance Covered}}{\text{Total Time Taken}}$$

$$= \frac{16+16}{4+2} = \frac{32}{6} = 5.33\, m/s$$

Types of Motion

• There are two types of motion: Uniform and Non-Uniform motion.

1. ***Uniform Motion:*** Uniform motion is characterized by an object moving in a ***straight line with a constant velocity***, which means that it covers ***equal distances*** in ***equal intervals of time***, resulting in ***zero acceleration***. ***E.g. If the speed of a car is 10 m/s, it means that the car covers 10 meters in one second. The speed is constant every second.***
   - ***Linear (Rectilinear) Motion:*** An object moving in a straight line at a constant speed (constant velocity).
   - ***Circular Motion:*** An object moving along a circular path at a constant speed (constant angular velocity).
   - ***Rotational Motion:*** An object rotating around a fixed axis at a constant angular speed.

2. ***Non-Uniform Motion:*** Non-uniform motion is when an object's ***speed*** or ***direction changes over time***, so it doesn't cover equal distances in equal time intervals. ***E.g. If a car covers 10 meters in the first two seconds and 15 meters in the next two seconds.***
   - ***Linear (Rectilinear) Motion:*** An object moving in a straight line with changing speed (acceleration).
   - ***Circular Motion:*** An object moving along a circular path with changing speed (acceleration).
   - ***Rotational Motion:*** An object rotating around a fixed axis with changing angular speed (angular acceleration).

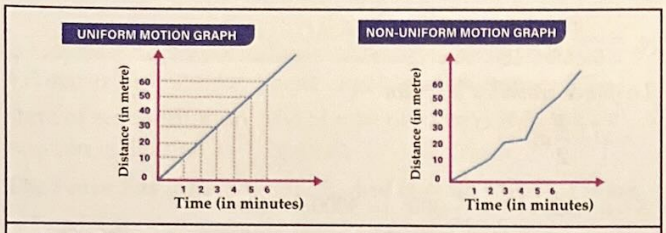
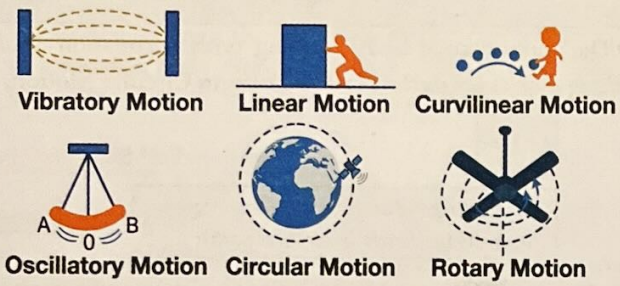


Fig 1: Graphical Representation of Uniform and Non-Uniform Motion



Velocity

• Velocity is the rate at which an object changes its position in a specific direction. Unlike speed, velocity is a vector quantity, which means it has both ***magnitude*** and ***direction***. The S.I. unit of velocity is ***m/s***.

$$\text{Speed + Direction = Velocity}$$

$$\text{Velocity} = \frac{\text{Displacement}}{\text{Time}}$$

$$v = \frac{d}{t} \qquad t = \frac{d}{v} \qquad d = v \times t$$

Odometer: It is used to measure the distance travelled by a vehicle.

Questionnaire

Usha swims in a 90 m long pool. She covers 180 m in one minute by swimming from one end to the other and back along the same straight path. The average speed and average velocity of Usha respectively is?

→Since, she covers 180 m in one minute by swimming from one end to the other and back along the same straight path, therefore, displacement of Usha in 1 min = 0 m.

$$\text{Average Speed} = \frac{180m}{1 \times 60s} = 3\,m/s$$

$$\text{Average Velocity} = \frac{0}{1 \times 60s} = 0\,m/s$$

Acceleration

• Acceleration is defined as the ***rate of change of velocity with respect to time.*** It essentially describes how quickly an object's speed or direction (or both) is changing. The S.I. unit of acceleration is m/s^2.

$$\text{Acceleration} = a_c$$

$$a_c = \frac{\text{Change in Velocity}}{\text{Time } (\Delta t)}$$

$$\frac{\text{Final Velocity - Initial Velocity}}{\text{Time } (\Delta t)}$$

$$= \frac{v-u}{\Delta t}$$

Questionnaire

Starting from a stationary position, Rahul paddles his bicycle to attain a velocity of 6 m/s in 30 s. Then he applies brakes such that the velocity of bicycle comes down to 4 m/s in the next 5 s. Calculate the acceleration of the bicycle in both the cases.

Sol

Case 1: He starts from a stationary position and attains speed of 6 m/s in 30 s.

Initial velocity (u) = 0 m/s

Final velocity (v) = 6m/s

Time taken (Δt) = 30s

$$a_c = \frac{6-0}{30} = \frac{1}{5} = 0.2\,m/s^2$$

Case 2: He applies brakes such that the velocity of the bicycle comes down to 4 m/s in next 5 s. Final velocity in Case 1 becomes the initial velocity in Case 2.

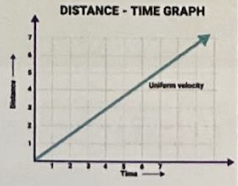
Initial velocity (u) = 6 m/s

Final velocity (v) = 4m/s

Time taken (Δt) = 5s

$$a_c = \frac{4-6}{5} = \frac{-2}{5} = -0.4\,m/s^2$$

Graph Representation



A distance time graph shows how far an object has travelled over a period of time. Distance is plotted on the Y-axis and time is plotted on the X-axis.

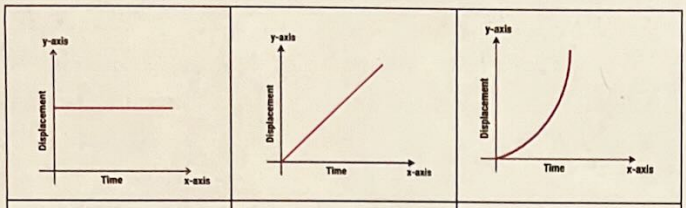
What it tells us

→The slope of the graph gives the speed of the object.

→A straight line with a constant slope means the object is moving at a constant speed.

→A curved line indicates that the speed is changing, which may mean acceleration or deceleration.

Displacement-Time Graph



For Stationary Body (Body at rest)	For Uniform Motion	For Non-Uniform Motion (speed increases)

Numerical of Motion in a straight line: The "UTSAV" Concept

•In case of uniform acceleration, there are three equations of motion that describe the motion of an object with constant acceleration.

1. $v = u + at$
2. $s = ut + ½\ at^2$
3. $v^2 - u^2 = 2as$

u: Initial velocity
t: Time
s: Distance
a: Acceleration
v: Final velocity

When an object starts from a stationary position or starts to free fall, its initial velocity (u) is 0 m/s.

Deceleration, also known as negative acceleration or retardation, refers to a decrease in an object's speed or velocity, which is the opposite of acceleration (increasing speed or velocity).

Motion Under Gravity

•Motion under gravity (also known as ***free-fall motion***) refers to the movement of an object solely influenced by the ***force of gravity***, resulting in a ***constant downward acceleration*** (approximately ***9.8 m/s²***).

1. $v = u + gt$
2. $s = ut + ½\ gt^2$
3. $v^2 - u^2 = 2gh$

a = g → Acceleration due to gravity
Free fall → u=0 (initial speed)

Upward Motion *(against the gravity)*

1. $v = u - gt$
2. $s = ut - ½\ gt^2$
3. $v^2 - u^2 = -2gh$

a = -g, final velocity at highest point = 0

Questionnaire

A train starting from rest attains a velocity of 72 km/h in 5 minutes. Assuming that the acceleration is uniform. The distance travelled by train for the above velocity is?

Sol

Initial velocity (u) = 0 km/h, Final velocity (v) = 72 km/h = 20 m/s and Time (t) = 5 min.

As per the first law of motion

$v = u + at$

$20 = 0 + (a_c \times 5 \times 60)$

$$a_c = \frac{20}{5\times 60} = \frac{1}{15}\ m/s^2$$

Distance travelled by train

$$s = ut + \frac{1}{2}at^2$$

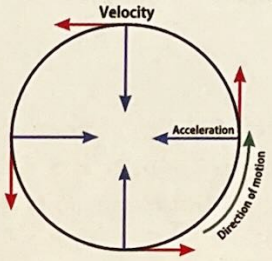
$$S = 0\times 300 + \left(\frac{1}{2}\times\frac{1}{15}300^2\right) = 3000m = 3km$$

UNIFORM CIRCULAR MOTION

•The motion of a body moving with a ***constant speed along a circular path*** is called Uniform Circular Motion.

$$a_c = \frac{v^2}{r}$$

a_c : Centripetal acceleration (acceleration towards the centre in circular path)



Centripetal force is the force acting on a body in a circular path. It points towards the center around which the body is moving.

•For a body moving in uniform circular motion the speed attained by the object will ***remain constant not the velocity*** as velocity depends on the direction of motion, and in circular motion the ***direction of the object changes at every point***. This continuous change in velocity results in an acceleration, even though the speed is constant.

Questionnaire

An athlete completes one round of a circular track of diameter 100 m in 20 s. What will be the displacement after 1 min and 10 s, respectively?

Sol:

Diameter of the track = 100m

One complete round takes, t = 20s

Total Time =1 min and 10s = 70 s

$$\text{No. of rounds} = \frac{70}{20} = 3.5 \text{ rounds}$$

After 3 full rounds, the athlete comes back to the starting point, so displacement = 0

After 0.5 round, the athlete reaches the diametrically opposite point of the circle.

Displacement after 3.5 rounds = Diameter of the circle
Displacement = 100m

("because as you know, displacement is the shortest distance between the initial and final point)

FORCE

• Force is an external agent capable of changing a body's state of rest or motion. The SI unit of force is ***Newton (N)***. A newton is defined as ***1 kg m/s²***.

The Force has different effects, and here are some of them:

→ Force can make a body that is at rest to move.

→ It can stop a moving body or slow it down.

→ It can accelerate the speed of a moving body.

→ It can also change the direction of a moving body along with its shape and size.

Force produces the change in velocity.

Balanced and Unbalanced Force

Balanced Force

• Balanced forces are forces that ***cancel each other*** out because they are equal in strength and act in opposite directions. The net force acting on an object when forces are balanced is ***zero*** ($F_{Net} = 0$)

Unbalanced Force

• Unbalanced forces are forces that are ***not equal in magnitude*** and/or act in the ***same direction***. The net force acting on an object when forces are unbalanced is not zero ($F_{Net} \neq 0$).

Balanced Force	*Unbalanced Force*
When the man pushes against the wall, the forces at play balance each other, and as a result, the wall does not move.	*One person significantly heavier than the other creates a condition of unbalanced forces in a seesaw.*
Case 1 10 N ← → 10 N Balanced Force Net Force = 0 Acceleration = 0	Case 2 20 N → ← 30 N Net Force = 10 N Unbalanced Force

Types of Forces

1. **Contact Force:** A contact force is a force that acts on a body either directly or through a medium.

Types

a) Frictional Force: Frictional Force refers to the force generated by two surfaces that contact and slide against each other.

b) Spring Force: The spring force is a restoring force exerted by a spring when it is stretched or compressed.

Hooke's Law

• It states that the force needed to extend or compress a spring (or any elastic material) by a certain distance is directly proportional to that distance.

2. **Non-Contact Force:** A non-contact force is a force applied to an object by another body that is not in direct contact with it.

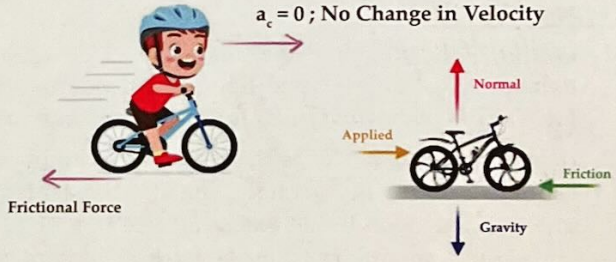
Types:

a) Gravitational Force: A gravitational force is an attractive force ***between two masses***.

b) Magnetic Force: Magnetic force is the force experienced by a moving electric charge/magnetic material in a magnetic field. It can also refer to the attractive or repulsive interaction ***between magnetic materials or magnets***.

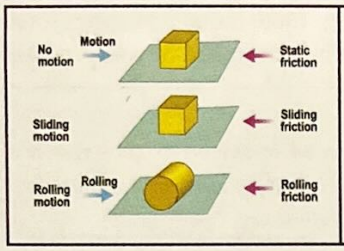
c) Electrostatic Force: The electrostatic force, also known as the Coulomb force, is the attractive or repulsive force ***between two electrically charged objects***.

TRICK to Remember non-contact forces: GEM



Conservative Forces	*Non-Conservative Forces*
Work done is independent of the path (depends on final and initial point).	Work done depends upon the path.
Work done is zero in case of a closed path.	Work done is not zero in case of a closed path.
Work done by it is completely recoverable.	Work done is not completely recoverable; some energy is lost (usually as heat).
E.g. Gravitational force, electrostatic, magnetic, spring force.	*E.g. Frictional force, Drag.*

Friction drag is a force that resists the motion of an object moving through a fluid (air/liquid).



Order of Force: Static Friction > Sliding Friction > Rolling Friction

LAWS OF MOTION

• *Galileo Galilei* first proposed the concept of *inertia*. By observing the motion of objects on an inclined plane Galileo deduced that *objects move with a constant speed when no force acts on them.*

• Galileo published a series of essays named: *De Motu* (Meaning: "On Motion")

• Galileo's first book: *La Bilancetta* ("The Little Balance") published in *1586*.

• *Newton* formulated the three laws of motion.

1st Law of Motion → *Law of Inertia*

• The Law of Inertia states that *"An object at rest remains at rest and an object in motion remains in motion at constant velocity unless acted upon by an external force"*.

Types of Inertia

1. *Inertia of Rest:* This is the tendency of an object to remain at rest unless acted upon by an external force. *E.g. The dry leaves and fruits falls when we shake a tree.*
2. *Inertia of Motion:* This is the tendency of an object to continue moving in a straight line at a constant speed unless acted upon by an external force. *E.g. A person sitting in a moving car may be pushed forward when the car stops abruptly as our legs are in contact with the surface.*
3. *Inertia of Direction:* This is the tendency of an object to continue moving in the same direction unless acted upon by an external force. *E.g. When a car makes a sharp turn, your body tends to move in the direction it was previously moving, rather than following the car's new direction.*

Inertia: The tendency of an object to resist changes in its state of motion. It depends on the mass of the object.

$$Inertia \propto Mass$$

2nd Law of Motion

• The 2nd Law of Motion states that *force equals mass times acceleration, or F = ma*. This law describes how the acceleration of an object depends on the force applied to it and the object's mass. *E.g. A cricketer pulling back his hand while catching the ball to avoid injury.*

Force = Rate of change of momentum
$F = ma$
$F = Kg\ m/s^2$

Derivation:

Change in momentum = **mv - mu**

Rate of change in momentum with time $= \frac{mv - mu}{t}$

We know $\frac{v-u}{t} = a$ (acceleration); $= \frac{m(v-u)}{t} = ma$

3rd Law of Motion

• The 3rd Law of Motion states that *"For every action, there is an equal and opposite reaction"* meaning if one object exerts a force on another, the second object will exert an equal and opposite force back on the first. *E.g. When a gun fires, the bullet experiences a forward force, and the gun experiences an equal and opposite force, causing it to recoil backward.*

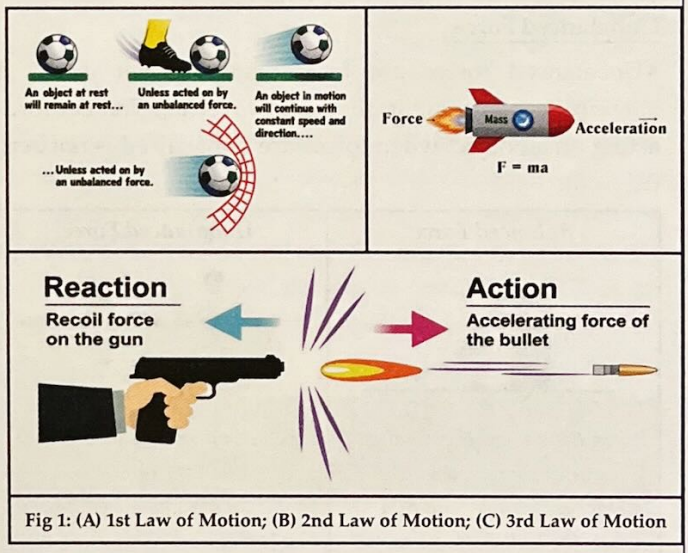


Fig 1: (A) 1st Law of Motion; (B) 2nd Law of Motion; (C) 3rd Law of Motion

Questionnaire

A constant force acts on an object of mass 5 kg for a duration of 2s. It increases the object's velocity from 3 m/s to 7 m/s. Find the magnitude of the applied force. Now if the force were applied for a duration of 5 s. What would be the final velocity of object?

Sol

$F = m \times a$

$F = m \times \frac{(v-u)}{t}$

$F = 5 \times \frac{(7-3)}{2}$

$F = 5 \times \frac{4}{2} = 10N$

$10 = 5 \times \frac{(v-3)}{5}$

$10 = V - 3$

$V = 13\ m/s$

Impulse and Momentum

• Momentum measures the *"quantity of motion"* of an object, defined as the product of its mass and velocity. The S.I. unit of Momentum is *Kg m/s*.

$$p = m \times v$$

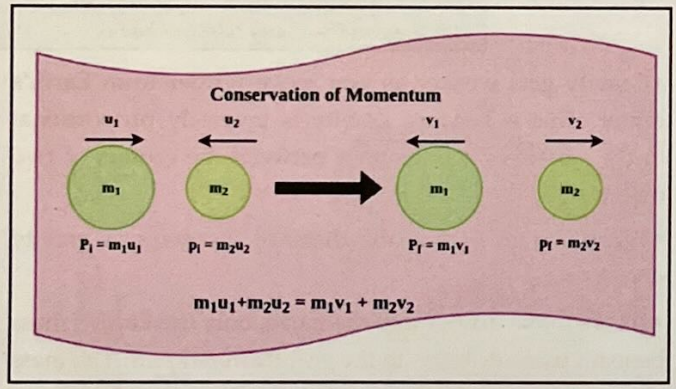
p = vector quantity
m = scalar quantity
v = vector quantity

• Impulse is the change in momentum of an object caused by a force acting over a short period of time.

Impulse-Momentum Theorem: $F \Delta t = m \Delta V$

Conservation of Momentum

• The conservation of momentum principle states that *"In a closed system, the total momentum remains constant"*, meaning momentum is neither created nor destroyed, but only transferred.



• In the equation m_1 and m_2 are masses of the bodies, u_1 and u_2 are the *initial velocities* of the body and v_1 and v_2 are the *final velocities* of the bodies (change in velocity not mass).

Questionnaire

A girl of mass 40kg jumps with a horizontal velocity of 5m/s onto a stationary cart with frictionless wheels. The mass of the cart is 3kg. What is her velocity as the cart starts moving?

Sol

Mass of girl (m_1) = 40kg

Velocity of girl before jump (u_1) = 5m/s

Mass of cart (m_2) = 3kg

Velocity of cart before jump (u_2) = 0 m/s

Final velocity of girl + cart system = v

$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$

(In this case, $v_1 = v_2 = v$)

$40 \times 5 + 3 \times 0 = (40 + 3) \times v$

$200 = 43v$

$v = 4.65$ *m/s*

UNIVERSAL LAW OF GRAVITATION

• *Newton* put forward the universal law of gravitation in *1687* and used it to explain the observed motions of the planets and moons.

Newton's Law of Universal Gravitation

• It states that "Every particle attracts every other particle in the universe with force directly proportional to the product of their masses and inversely proportional to the square of the distance between them."

The Universal Gravitation Equation

$$F \propto \frac{m_1 m_2}{r^2}$$

$$F = \frac{G m_1 m_2}{r^2}$$

- *Mercury nearest to Sun: 88 days revolution*
- *Neptune farthest to Sun: 165 yrs revolution*

→ *F is the gravitational force between bodies, m_1 and m_2 are the masses of the bodies, r is the distance between the centres of two bodies, G is the universal gravitational constant.*

→ *The value of G is found to be G = 6.673 × 10 $^{-11}$ Nm²/kg²*

(Discovered experimentally by Henry Cavendish in 1798)

• The gravitational force is both a *non-contact force* (acting at a distance) and a *conservative force* (work done is independent of path and work done in a closed path is zero).

Kepler's Planetary Laws

First Law: Law of Orbit (1609)

• It states that *"Planets move in elliptical orbits with the Sun as a focus."*

Second Law: Law of Area (1609)

• It states that *"The line joining the planet and the Sun sweep out equal areas in equal interval of time."*

Third Law: Law of Time Period (1619)

• It states that *"The square of the time period of revolution of a planet around the Sun is directly proportional to the cube of its mean distance from the Sun."*

$$T^2 \propto r^3$$

Mass Vs Weight

Mass	*Weight*
The mass of a body is the amount of matter present in it	The weight of a body is the force with which the earth attracts it
It has magnitude but not direction (scalar quantity)	It has both magnitude and direction (vector quantity)
It does not change from place to place	It changes from place to place (W = m × g)
It can never be zero	It is zero at the center of earth
Its S.I. Unit is kilogram	Its S.I. Unit is Newton

Variation in Gravity

1. *The gravity is more at the poles than at the equator.*
2. *The gravity decreases with altitude.*
3. *The gravity on the moon is 1/6th of Earth's gravity.*

$$F = \frac{GMm}{R^2}$$

$$M \times g \frac{GMm}{R^2}$$

$$g = \frac{GM}{R^2}$$

$$g = 9.8 \text{ m/s}^2$$

M = Mass of the Earth

R = Radius of the Earth

G = Universal Gravitational Constant

g = Acceleration due to gravity

"g" represents the acceleration that an object experiences due to the Earth's gravity (or the gravity of any celestial body).

• Gravity gets weaker as you move farther from Earth's center. This is because gravity is inversely proportional to the square of the distance between the centers of two objects.

• When we go *higher*, the distance *increases* → gravity *decreases*.

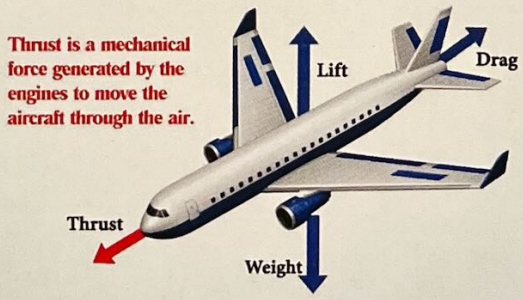
• As we move deeper into the Earth, only the Earth's mass beneath us contributes to the *gravitational pull*. The mass above us has *no effect* → gravity also *decreases*.

• So, gravity is strongest at the surface and weaker both above and below it.

Thrust

• Thrust is a force, or push, that acts on a surface in a direction perpendicular (normal) to that surface. It is measured in *Newton (N)*.

Example: Thrust is generated by the engines of an aircraft through some kind of propulsion system.



Pressure

- Pressure is the force (or thrust) acting per unit area.

S.I. unit is *Pascal (Pa)*.

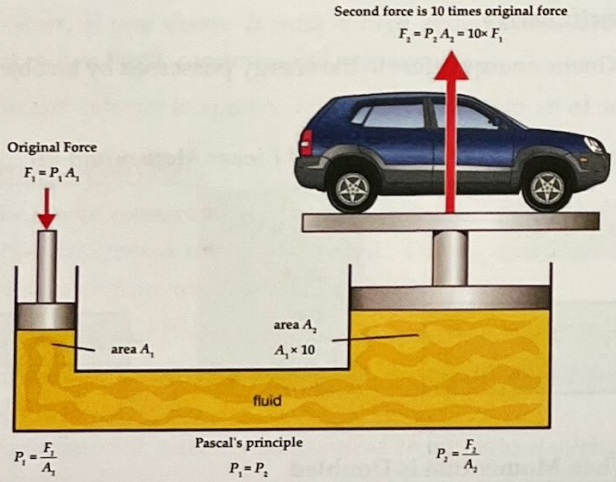
$$\text{Pressure} = \frac{\text{Thrust/ Force}}{\text{Area}}$$

$$P = \frac{Kgm}{s^2 m^2} \text{ or } 1\ Pa = \frac{N}{m^2}$$

Pascal's Law

- Pascal's law (also Pascal's principle or the principle of transmission of fluid pressure) is a principle given by *Blaise Pascal* which states that *"A pressure change at any point in a confined incompressible fluid is transmitted throughout the fluid such that the same change occurs everywhere."*
- It was given in *1653* and published in *1663*.

$1atm = 1.013 \times 10^5\ Pa$
$1atm = 1.01325\ bar$
$1N = 10^5\ Dyne$



$$P_1 = \frac{F_1}{A_1} \qquad P_2 = \frac{F_2}{A_2}$$

$$P_1 = P_2$$

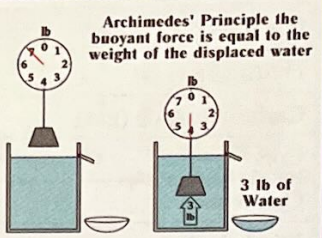
$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

Archimedes' Principle

- Archimedes' principle states that *"The upward buoyant force that is exerted on a body immersed in a fluid whether fully or partially is equal to the weight of the fluid that the body displaces."*

$$F_b = \rho g V$$

F_b = *Buoyant force*
ρ = *Fluid density*
g = *Acceleration due to gravity*
V = *Fluid volume*



E.g. A ship will float higher in saltwater than in freshwater because the denser saltwater exerts a greater buoyant force, requiring the ship to displace less volume of water to remain afloat. The same principle applies to a person swimming, who will feel lighter and easier to float in saltwater.

Bernoulli's Principle

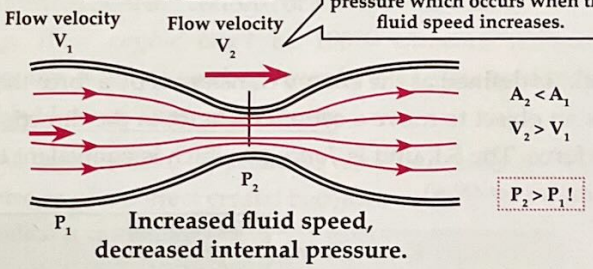
- Bernoulli's principle is a key concept in fluid dynamics. It states that *"In a streamlined flow of incompressible, non-viscous fluid, the sum of pressure energy, kinetic energy, and potential energy per unit volume remains constant".*

Energy per unit volume before = Energy per unit volume after

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$$

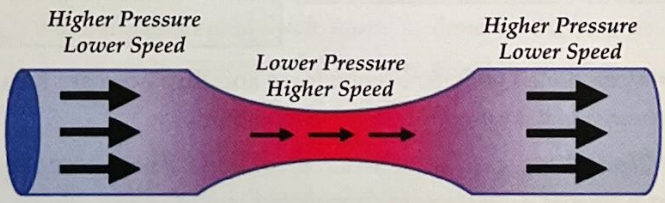
Pressure Energy | Kinetic Energy per unit volume | Potential Energy per unit volume

The often cited example of the Bernoulli Equation or "Bernoulli Effect" is the reduction in pressure which occurs when the fluid speed increases.



Increased fluid speed, decreased internal pressure.

Pressure energy + Kinetic energy + Potential energy = Constant



Relative Density

- Relative density is the ratio of the density of a substance to the density of a reference substance (usually water for liquids and solids).

$$\text{Relative Density} = \frac{\text{Density of a Substance}}{\text{Density of Water}}$$

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

- *S.I. unit of density is kg/m^3.*
- *Relative Density has no S.I. unit.*

Substance	Density (g/mL)
Hydrogen (gas)	0.000089
Carbon dioxide (gas)	0.0019
Cork	0.21
Oak wood	0.71
Ethyl alcohol	0.79
Water	1.00
Magnesium	1.74
Table salt	2.16
Sand	2.32
Aluminum	2.70
Iron	7.86
Copper	8.92
Lead	11.34
Mercury	13.59
Gold	19.3

Table 1 : Common Densities Of few substances

WORK AND ENERGY

Work

• "Work" is defined as the energy transferred by a force that causes an object to move a certain distance in the direction of the force. The S.I. unit is *Joule (J)* which is equivalent to *Newton-meter (Nm)*

$$\text{Work Done} = \text{Force} \times \text{Displacement}$$

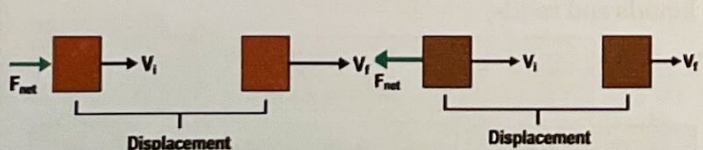
$$\text{Work Done} = FS\cos\theta$$

- *Work done is a scalar quantity.*
- *The S.I. unit of energy is Joule. It is named after English physicist James Prescott Joule.*

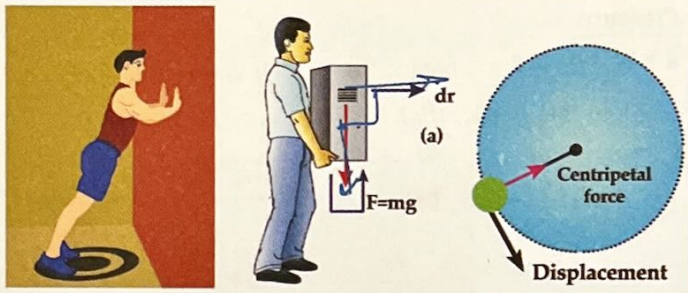
• Work done is *positive* when force and displacement have *same direction* (are parallel to each other).

• Work done is *negative* when force and displacement are in *opposite directions (anti-parallel, angle 180°).*

• Work done is *zero*, when force and displacement are *perpendicular (angle - 90°).*Work done is zero when there is no displacement.



Positive Work *Negative Work*



(a) (b) (c)

Zero Work

Energy

• Energy is defined as the *capacity to do work*, or the ability to cause change. It may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other various forms.

• S.I. unit of energy is *Joule (J).* Biggest source of energy is the Sun.

Forms of Energy

Kinetic Energy

• Kinetic energy refers to the energy possessed by an object due to its *motion.*

Relationship between K.E. and Linear Momentum (p)

$$K.E. = \frac{1}{2}mV^2$$

$$K.E. = \frac{1}{2}mV^2 \times \frac{m}{m}$$

$$= \frac{(mV)^2}{2m}$$

$$K.E. = \frac{p^2}{2m}$$

m = Mass
V = Velocity

$$p = mV$$

When Momentum is Doubled

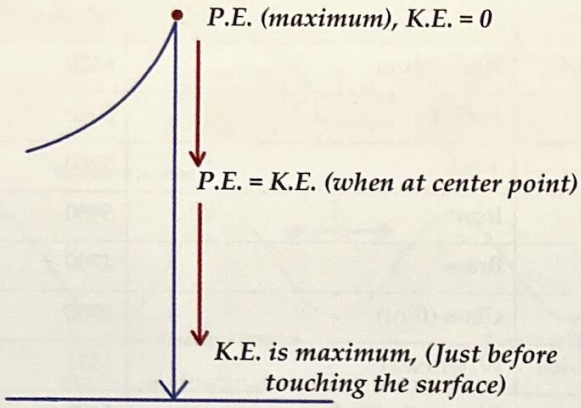
• *If momentum (p) doubles, the kinetic energy (K. E.) becomes 4 times.*

$$K.E. = \frac{(2p)^2}{2m} = \frac{4p^2}{2m}$$

Potential Energy

• Potential energy (P.E.) is stored energy that an object has because of its position or state, ready to be released and do work. *E.g. Gravitational P. E.*

• The concept of a dam is fundamentally based on potential energy (P.E.), where the stored water at a height possesses potential energy that can be converted into kinetic energy (motion) and used in *turbines* to generate *electricity* for other purposes.



$P.E. = mgh$

m = Mass of the body
g = Acceleration due to gravity
h = Height

Escape Velocity

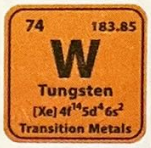
- The velocity needed for a body to escape from a gravitational centre of attraction without undergoing any further acceleration. ***E.g. Imagine throwing a ball upwards, if you throw it lightly, it comes back down due to gravity; however, if you throw it with a high enough velocity, it will escape Earth's gravity and never return.***
- Escape velocity is approx. *11.2 km/s*.

Law of Conservation

- The law of conservation of energy states that *"Energy can neither be created nor be destroyed. Although, it may be transformed from one form to another."*
- The *1st Law of Thermodynamics* is based on this concept.

1. ***Dynamo:*** It converts *mechanical energy* into *electrical energy*.
2. ***Generator:*** It converts *mechanical energy* into *electrical energy*.
3. ***Motor:*** It converts *electrical energy* into *mechanical energy*.
4. ***Microphone:*** It converts *sound energy* into *electrical energy*.
5. ***Loudspeaker:*** It converts *electrical energy* into *sound energy*.
6. ***Photosynthesis:*** Process by which plants, algae, and some bacteria convert *light energy* (primarily from sunlight) into *chemical energy* in the form of sugars, using carbon dioxide and water, and releasing oxygen as a byproduct.
7. ***Battery:*** It converts *chemical energy* into *electrical energy*.
8. ***Bulb:*** It converts *electrical energy* primarily into *light energy* and *heat energy*. Bulb filament is made of *Tungsten (W)*.

Mechanical energy is defined as the total amount of potential energy (PE) and kinetic energy (KE) an object possesses.



Melting Point : 3422°C

Laws of Thermodynamics

Zeroth Law of Thermodynamics

- ***It states that:*** *"If body A is in thermal equilibrium with B, and B is in thermal equilibrium with C, then A is also in thermal equilibrium with C."*

First Law of Thermodynamics

- ***It states that:*** *"Energy can neither be created nor be destroyed only converted from one form to another"*.
- It is the law of conservation of energy applied to heat.

Formula: $Q = \Delta U + W$

Zeroth law was given by Ralph H. Fowler in 1931

Q = Heat added to the system
ΔU = Change in internal energy
W = Work done by the system

Second Law of Thermodynamics

- Heat cannot flow from a colder body to a hotter body on its own.
- It introduces the concept of *entropy* (disorder).

E.g. Heat engine can't be 100% efficient, refrigerator requires external work to transfer heat from cold to hot.

Third Law of Thermodynamics

- As temperature approaches absolute zero (0 K), the entropy of a perfect crystal becomes *zero*.

Entropy, the measure of a system's thermal energy per unit temperature that is unavailable for doing useful work.

Power

- Power is the *rate at which work is done* or the rate at which energy is transferred from one place to another or transformed from one type to another.
- The S.I. unit of power is *Watt (W)*.

$Power = \frac{Work}{Time}$

Power = Force × Velocity

P = FV

A watt (W) is a unit of power, specifically defined as one joule of energy transferred or converted per second (1 J/s).

Horse Power

Horsepower *(hp)* is a unit of *measurement of power*, or the rate at which work is done, often used to describe the output of engines or motors.

1 hp = 746 W
1 hp = 0.746 kW

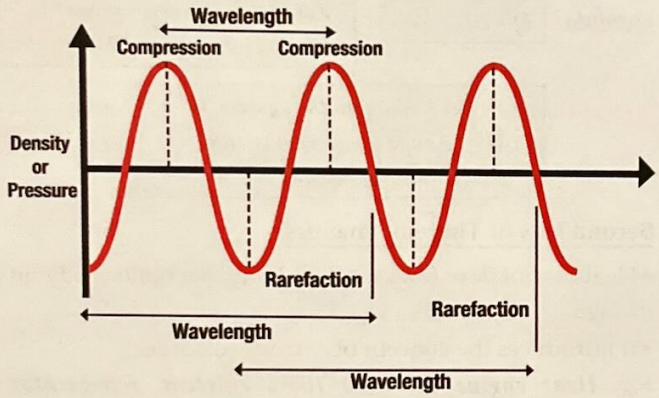
1 kW = 1000W

SOUND

•Sound is a form of energy, a vibration that travels through a medium (like air, water, or solids) as a *mechanical wave*, and is perceived by the human ear as an audible sensation.

•Sound is produced when an object vibrates, creating a pressure wave. This *pressure wave* causes particles in the surrounding medium (air, water, or solid) to have vibrational motion.

• As the object vibrates back and forth, it creates areas of *high pressure* (compressions) and *low pressure* (rarefactions) in the medium.



Sound in Different Media

• *Air:* Sound travels as *longitudinal waves* in air, where the vibrations are parallel to the direction of wave propagation.

• *Water:* Sound also travels as *longitudinal waves* in water.

• *Solids:* Sound can travel as *both longitudinal* and *transverse waves* in solids.

Speed of Sound

• Sound travels fastest in solids, slower in liquids, and slowest in gases.

Solid > Liquid > Gas

The particles in solids are tightly packed and can transfer energy (sound) quickly, leading to faster propagation.

Speed of Light = 3×10^8 m/s

Speed of light is more than speed of sound (343 m/s)

State	*Substance*	*Speed in m/s*
Solids	Aluminium	6420
	Nickel	6040
	Steel	5960
	Iron	5950
	Brass	4700
	Glass (flint)	3980
Liquids	Water (sea)	1531
	Water (distilled)	1498
	Ethanol	1207
	Methanol	1103
Gases	Hydrogen	1284
	Helium	965
	Air	346
	Oxygen	316
	Sulphur dioxide	213

Table 1 : Speed Of Sound in Different Media

Sound wave cannot be polarised, but light wave can be.

Sound Waves

•Sound waves are disturbances that travel through a medium (like air, water, or solids) as a result of vibrations.

• *Types of Waves: Mechanical Waves* and *Non-Mechanical Waves .*

Mechanical Waves	*Non-Mechanical Waves*
Medium is required to propagate	No medium is required to propagate
E.g. Sound waves	*E.g. Light waves*

Types of Mechanical Waves

1. *Transverse Waves:* Transverse waves are waves that move *perpendicularly to the direction of its propagation.* This means that the wave forms a right angle with the direction it travels. *E.g. Light*

λ = Wavelength

2. *Longitudinal Waves:* Longitudinal waves are waves where the particles of the medium vibrate *parallel to the direction of its propagation, E.g. sound waves or pressure waves.*

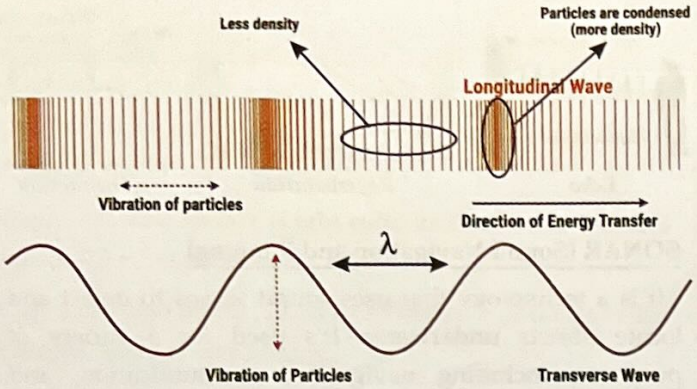


Fig 1: Longitudinal und Transverse Waves

Compression in a longitudinal wave is a region where the particles are the closest together while rarefaction in a longitudinal wave is a region where the particles are spread out.

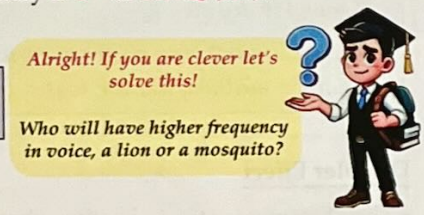
Characteristics of Sound Waves

Sound waves have several characteristics, including:

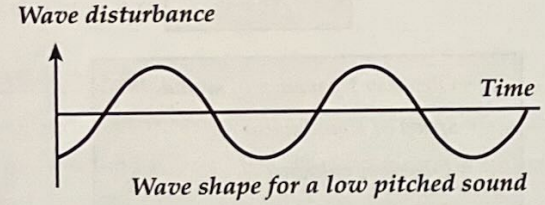
Frequency

- The number of times a sound wave cycles per second, which determines the pitch of the sound.
- Girls have high pitched voice, high shrillness (their vocal cords vibrate quickly).
- The S.I. unit of frequency is s^{-1} or *Hertz (Hz)*.

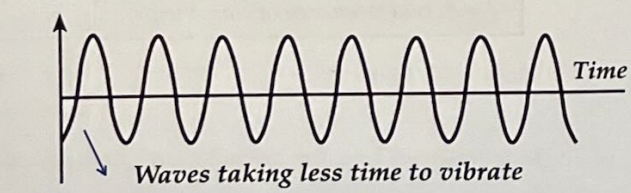
$$\text{Frequency } (v) = \frac{1}{\text{Time}}$$



- A high pitch sound has *faster vibrations* and *higher wave frequency*. A low pitch has *slower vibrations* and a *lower wave frequency* of the sound.



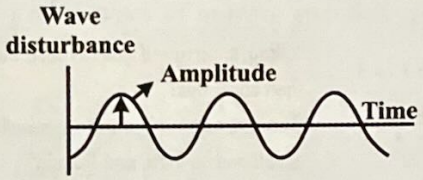
Wave shape for a low pitched sound



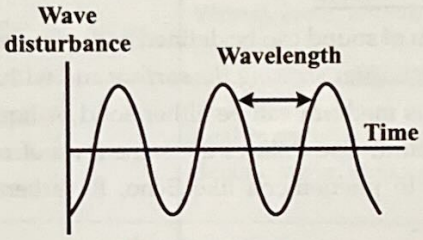
Waves taking less time to vibrate

Amplitude

- Amplitude is the maximum displacement of vibrating particles from their mean (equilibrium) position. It represents the loudness (intensity) of a sound wave.
- *Greater amplitude = louder sound.*
- Unit: *Metre (m)* in the S.I. system
- *Decibel (dB):* Unit of sound intensity level.
- The range of sound intensities a human ear can generally perceive is from 0 to 130 decibels (dB). Sound above this is considered as noise.
- The amplitude of the sound wave depends upon the force with which an object is made to vibrate. If we strike a table lightly, we hear a soft sound because we produce a sound wave of less energy (amplitude). Conversely, a loud sound has a large amplitude.



Soft sound



Louder sound

Timbre *(Tone Quality/Tone Colour)*

- Timbre is the quality of a sound that distinguishes it from other sounds having the *same pitch* and *loudness*.

Note

- Note is produced due to a mixture of *several frequencies* (fundamental + overtones), not just a single frequency.

Audible Range

- The audible range is the range of sound frequencies that humans can hear, which is from *20 Hz to 20,000 Hz (20 kHz)*.

→ ***Infrasonic:*** Sounds *below 20 Hz* that humans can't hear. Many animals can hear infrasonic sounds. ***E.g. sounds produced by earthquakes.***

→ ***Ultrasonic:*** Sounds *above 20,000 Hz* that humans can't hear.

Applications of Ultrasonic Sounds:

- It is produced by bats and dolphins.
- Ultrasound is banned in gender determination.
- It is used to monitor growth and development of foetus.
- It is used to identify kidney stones and to break kidney stones.
- It is used to identify the conditions of our internal organs.

Mach Number

- Mach number is the ratio of the speed of an object to the speed of sound in the surrounding medium.

$$\text{Mach No.} = \frac{\text{Speed of a Body}}{\text{Speed of Sound in that Medium}}$$

Speed of Objects Based on Mach Number

- *Subsonic:* <1
- *Supersonic:* 1 to 5
- *Hypersonic:* >5
- *Transonic:* ≈ 1

Reflection of Sound

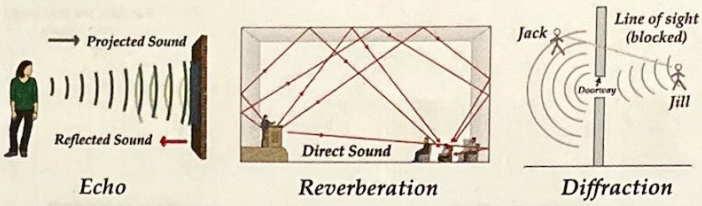
- Reflection of sound can be defined as the ***bouncing back of sound waves after striking the surface*** and within the same media. This medium can be either solid or liquid. Similar to light, sound also follows the same laws of reflection. It gives rise to phenomena like Echo, Reverberations, and Diffraction.

Echo: An echo is the reflected repetition of a sound that occurs when ***sound waves bounce off a surface and return to the listener***, allowing the sound to be heard again after the original has faded.

Reverberation: It is the ***continued presence of sound in an enclosed space*** even after the original sound source has stopped. This occurs due to repeated reflections of sound waves from surfaces like walls, ceilings, and furniture, causing the sound to linger before gradually fading away as it gets absorbed.

Diffraction: Diffraction is the ***bending of sound waves*** as they move around obstacles or through small openings. This allows us to hear sounds even when the source is hidden from view.

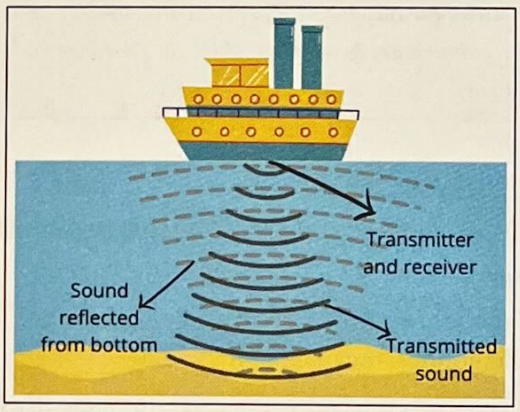
For hearing distinct echoes, the minimum distance of the obstacle from the source of sound must be at least 17.2 m.



Echo *Reverberation* *Diffraction*

SONAR (Sound Navigation and Ranging)

- It is a technology that uses sound waves to detect and locate objects underwater. It's used for a variety of purposes, including navigation, communication, and mapping.
- It emits sound waves and analyses the echoes that bounce back.



- *Velocity of Sound in moist air is greater than the velocity of sound in dry air.*
- *Sound cannot travel through a vacuum because it requires a medium, like air, water, or solids to propagate.*

Doppler Effect

- The Doppler effect is the change in frequency or wavelength of a wave as perceived by an observer who is moving relative to the source of the wave.

$$f_0 = \frac{v + v_0}{v + v_s} f_s$$

f_o = *Observer frequency of sound*
v = *Speed of sound wave*
v_o = *Observer velocity*
v_s = *Source velocity*
f_s = *Actual frequency of sound wave*

LIGHT

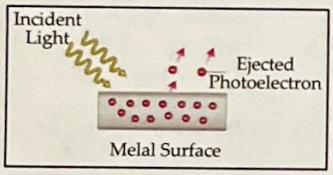
- Light is defined as a form of electromagnetic radiation, specifically the part of the electromagnetic spectrum that is visible to the human eye.
- Light has ***dual nature*** (Light exhibits both wave-like and particle-like characteristics).
- Light can also be described as a stream of particles called ***photons***, which carry energy.
- Light travels at a constant speed in a vacuum, ***approx.*** 3×10^8 ***m/s***.
- Light is a ***form of transverse wave*** that travels in vacuum.
- Light can be ***polarized***.

Young's Double-Slit Experiment

- It was performed in ***1801*** by ***Thomas Young, demonstrates the wave-like nature of light***, showing that light can interfere with itself, creating an interference pattern of bright and dark fringes.

Photoelectric Effect

- The photoelectric effect is a phenomenon where electrons are emitted from the metal surface when light of sufficient frequency is incident upon it.
- This effect led to the conclusion that light is made up of ***packets or quanta of energy***.
- ***Heinrich Rudolf Hertz*** was the first to observe the photoelectric effect in ***1887***.



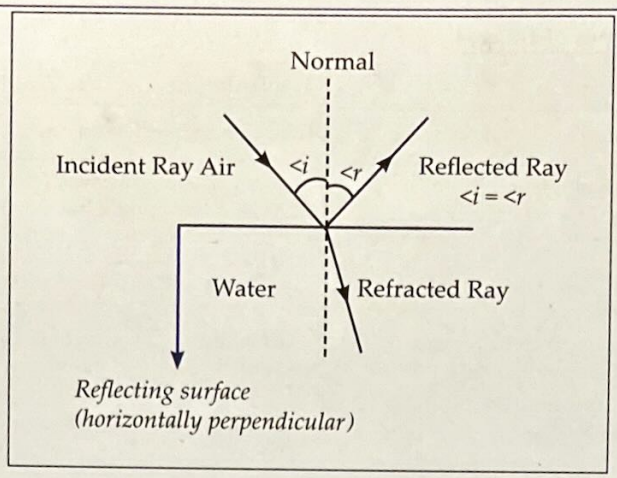
- In ***1905, Albert Einstein*** proposed the existence of photons, ***discrete packets of energy***, to explain the photoelectric effect and other light-related phenomena (received Nobel Prize in ***1921***).

Reflection of Light

- Reflection occurs when light rays strike a surface and change direction, returning to the same medium instead of passing through or being absorbed.

Laws of Reflection

1. The ***angle of incidence (i)*** is equal to the ***angle of reflection (r)***.
2. The incident ray, reflected ray, and the normal ***all lie in the same plane***.



SPHERICAL MIRRORS

There are different types of mirrors and they are broadly classified as:

→ Plane Mirrors, Concave Mirrors, Convex Mirror.

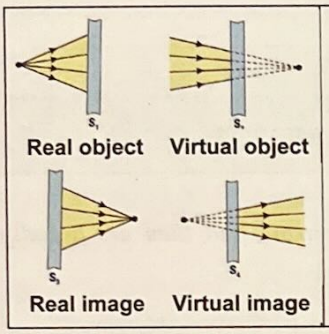
Type	*Description*	*Image Nature*
Plane Mirror	Flat mirror	Virtual, erect, laterally inverted
Concave Mirror	Reflecting surface curves inward	Real/Inverted or Virtual/ Erect depending on object position
Convex Mirror	Reflecting surface curves outward	Always Virtual, erect, and diminished

Fig 1: Image Formation in (A) Concave Mirror; (B) Convex Mirror; (C) Plane Mirror

- Images are classified as ***either real or virtual***, based on whether light rays actually converge to form the image, or only appear to diverge from a point.

Types of Images:

Real Image	*Virtual Image*
Can be projected on a screen.	Cannot be projected on a screen.
Formed when light rays actually converge and intersect after reflection or refraction.	Formed when light rays appear to diverge from a point, but do not actually intersect.
Always inverted (upside down).	Always upright (right side up).
Formed by concave mirrors and convex lenses.	Formed by convex mirrors, concave lenses, and plane mirrors.



Real objects are points from which light diverges. Virtual objects are points towards which light converges.

Image Formation in Plane Mirror

- *Virtual Image:* The image *cannot be projected onto a screen* and is formed *behind the mirror.*
- *Erect Image:* The image is *upright* (not inverted), i.e., it has the *same orientation as the object.*
- *Lateral Inversion:* The left and right sides of the object appear *interchanged in the image.*
- *Same Size:* The image and object have the *same size.*
- *Equal Distances:* The distance between the *object* and the *mirror* is equal to the distance between the *image* and the *mirror.*

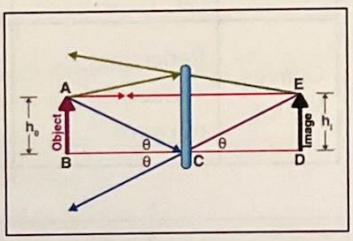
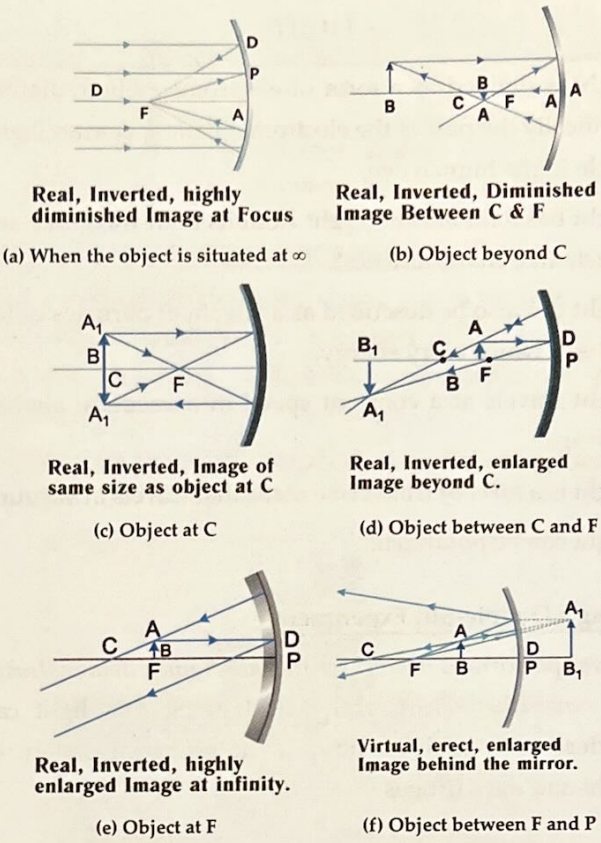


Image Formation by Concave Mirror

- A concave mirror can form both real and virtual images.

Object Position	*Image Position*	*Nature*	*Image Size*
At infinity	At focus	Real, inverted	Highly diminished
Beyond C	Between C & F	Real, inverted	Diminished
At C	At C	Real, inverted	Same size
Between C & F	Beyond C	Real, inverted	Enlarged
At F	At infinity	Real, inverted	Highly enlarged
Between F & P	Behind mirror	Virtual, erect	Enlarged



C: Curvature
F: Focus
P: Pole

Fig 2: Image Formed by a Concave Mirror

Image Formation by Convex Mirror (Diverging in Nature)

- A convex mirror forms an image that is always virtual, erect, and diminished (regardless of the object's position) and appears behind the mirror.

Object Position	*Image Position*	*Nature*	*Image Size*
At infinity	At F, behind the mirror	Virtual, erect	Highly diminished, point-sized
Between infinity and P of the mirror	Between P and F behind the mirror	Virtual, erect	Diminished

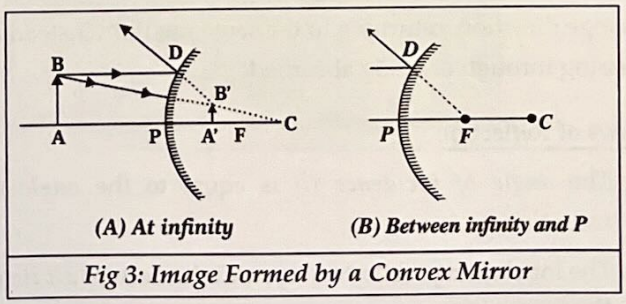
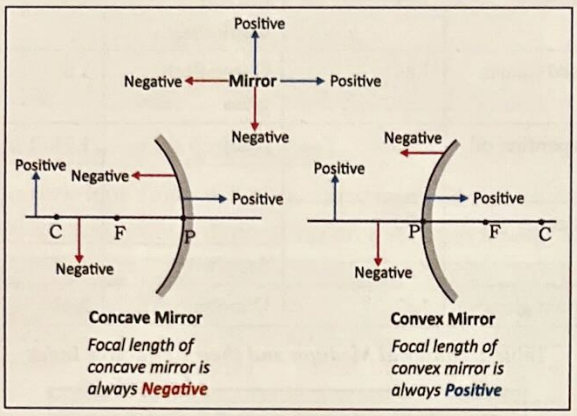


Fig 3: Image Formed by a Convex Mirror

Sign Convention in Spherical Mirror

- All distances are ***measured from the pole*** of the mirror.
- Distances to the right of the pole are considered ***positive***.
- Distances to the left of the pole are considered ***negative***.
- Distances above the principal axis are considered ***positive***.
- Distances below the principal axis are considered ***negative***.



In Spherical Mirrors

- ***Object Distance (u):*** Always ***negative*** (since the object is placed in front of the mirror).
- ***Image Distance (v):***

→ ***Concave mirror:*** Real image (v is ***negative***) and virtual image (v is ***positive***).

→ ***Convex mirror:*** Image is always virtual and v is positive.

- ***Focal Length (f):*** Concave mirror (f is ***negative***) and convex mirror (f is ***positive***).
- ***Radius of Curvature (R):*** Same sign as focal length (***R=2f***).

Mirror Formula

$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f}$$

$$\text{Magnification of Mirrors} = \frac{hi}{h_o} = \frac{-v}{u}$$

→ *M = 2 (image size is twice the size of an object)*

M = - 2 image is real and inverted)

M = 0.2 image size is smaller than the object)

Questionnaire

An object 4.0 cm in size, is placed 25.0 cm in front of a concave mirror of focal length 15.0 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image ? Find the nature and the size of the image.

Sol: Given

Object height (h_o) = 4.0 cm

Object distance (u)= –25.0 cm (object is in front → negative)

Focal length (f) = –15.0 cm (concave mirror → negative)

$$\frac{1}{v}+\frac{1}{u}=\frac{1}{f} \qquad \frac{1}{v}=\frac{1}{-15}+\frac{1}{25}$$

$$\frac{1}{v}+\frac{1}{-25}=\frac{1}{-15} \qquad \frac{1}{v}=\frac{-5+3}{75}=\frac{-2}{75}$$

$$v = -37.5cm$$

$$M=\frac{v}{u}=\frac{-37.5}{-25} \quad M=-1.5 \quad \text{Image Height}\,(h_i) = M\times h_o = 1.5\times 4 = -6 \text{ cm}$$

Conclusion:

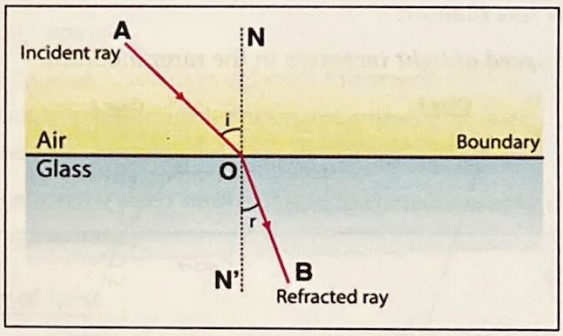
- ***The image is real (since image is formed on the same side as the object) and inverted (magnification is positive but real images in concave mirrors are inverted).***

Uses of Spherical Mirrors

- ***Concave Mirror:*** Shaving and Dentist Mirrors, Car Headlights, Telescopes, Solar Furnace, etc.
- ***Convex Mirror:*** Rear view Mirrors in Vehicles, Security Monitors in ATMs and Stores, Surveillance Mirrors, Sunglasses, etc.

Refraction of Light

- The refraction of light is the bending of light rays as they pass from one medium to another, thereby causing a change in its speed and direction. Refraction occurs ***due to a change in the speed of the light ray or wave.***
- While the speed and wavelength of light changes as it moves into a different medium, the frequency, which is determined by the light source, remains constant.



- This bending by refraction makes it possible for us to have lenses, magnifying glasses, prisms and rainbows.

Laws of Refraction

1. The incident ray, the refracted ray and the normal at the point of incidence: ***All lie in the same plane.***
2. The ratio of the sine of the angle of incidence (i) and sine of the angle of refraction (r) is ***constant*** (also known as ***Snell's Law***).

$$\frac{\text{Sin } i \text{ (Angle of Incidence)}}{\text{Sin } r \text{ (Angle of Refraction)}} = \text{Constant} = \mu$$

**where μ(mu) is the refractive index of the second medium with respect to the first.*

Light has rectilinear motion (moves in a straight line).

Refractive Index (μ)

$$\mu = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}}$$

Types of Media

1. ***Rarer Medium:*** Light bends ***away from the normal*** when moving from a denser to a rarer medium.
2. ***Denser Medium:*** Light ***bends toward the normal*** when moving from a rarer to a denser medium.

Let's Take a Look At Three Cases

→ ***Case A: Same Medium (No Refraction)***

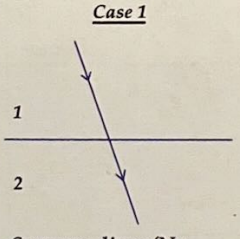
- When light travels through two media with the same optical density (E.g., air to air or water to water), it continues in a ***straight line without bending***.
- This is because the ***speed of light remains constant***, and there's no change in the direction of the light ray.

→ ***Case B: From Rarer to Denser Medium***

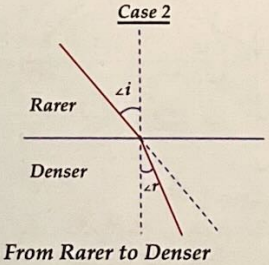
- When light travels from a rarer medium to a denser medium (E.g., air to glass or water), it ***bends towards the normal*** (the line perpendicular to the surface at the point of incidence).
- ***∠i is greater than ∠r.***
- The ***speed of light decreases*** in the denser medium.

→ ***Case C: From Denser to Rarer Medium***

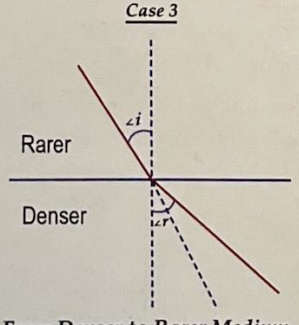
- When light travels from a denser medium to a rarer medium (e.g., glass to air), it ***bends away from the normal.***
- ***∠i is less than ∠r.***
- The ***speed of light increases*** in the rarer medium.



Same medium (No Refraction) with same density



From Rarer to Denser Medium ∠i > ∠r



From Denser to Rarer Medium
∠i < ∠r

Material medium	*Refractive index*	*Material medium*	*Refractive index*
Air	1.0003	Canada Balsam	1.53
Ice	1.31		
Water	1.33	Rock salt	1.54
Alcohol	1.36		
Kerosene	1.44	Carbon disulphide	1.63
Fused quartz	1.46	Dense flint glass	1.65
Turpentine oil	1.47	Ruby	1.71
Benzene	1.50		
		Sapphire	1.77
Crown glass	1.52	Diamond	2.42

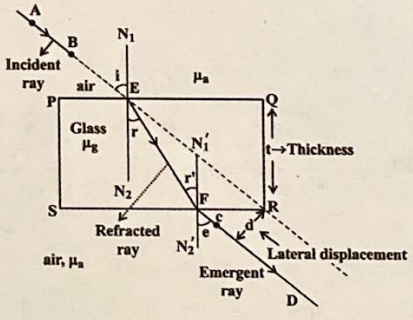
Table 1: Material Medium and their Refractive Index

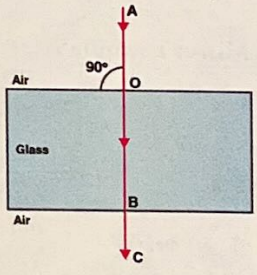
**Speed of light in air/ vacuum = 3×10^8 m/s.*

Refraction Through Glass Slab

When light passes through a glass slab:

- It ***bends towards the normal*** on entering (air → glass, denser medium).
- It ***bends away from the normal*** on exiting (glass → air, rarer medium).
- The ***emergent ray is parallel to the incident ray*** but slightly shifted sideways → this is called ***lateral displacement***.





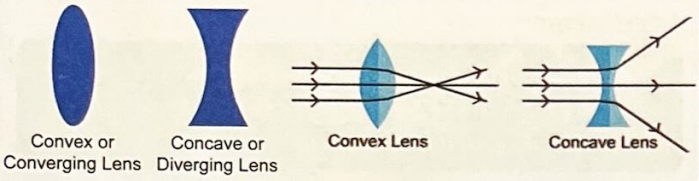
No refraction when light falls perpendicularly

Fig4: Refraction Through Glass Slab

SPHERICAL LENSES

Spherical Lenses

- Spherical lenses are optical devices with curved, spherical surfaces that refract (bend) light, either converging or diverging it. They are classified into two main types: ***Convex (converging) and Concave (diverging) lens.***



→ *Convex Lens : Centre bulged, ends narrow*

→ *Concave Lens : Centre narrow, ends wider*

→ *Convex Lens = Concave Mirror*

→ *Concave Lens = Convex Mirror*

Image Formation by Convex Lens

• A convex lens (also called a converging lens) can form *real or virtual images* depending on the object's position.

Object Position	*Image Position*	*Nature*	*Image Size*
At infinity	At focus (F)	Real, inverted	Highly diminished
Beyond 2F	Between F and 2F	Real, inverted	Diminished
At 2F	At 2F	Real, inverted	Same size
Between F and 2F	Beyond 2F	Real, inverted	Enlarged
At focus (F)	At infinity	Real, inverted	Highly enlarged
Between F and O	On same side of the lens	Virtual, erect	Enlarged

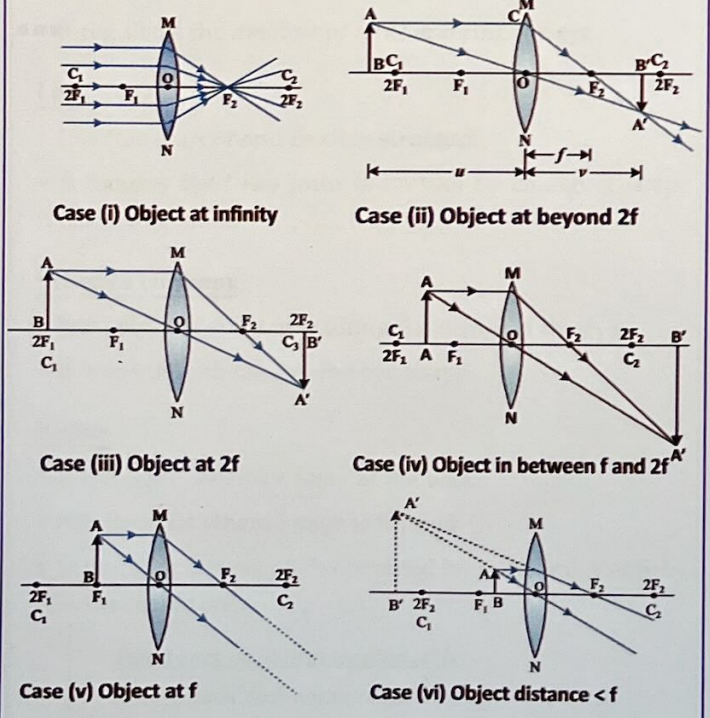


Fig 5: Image Formed by Convex Lens

Image Formation by Concave Lens

• A concave lens always forms a *virtual, erect, and diminished image*, regardless of the object's position.

Object Position	*Image Position*	*Nature*	*Image Size*
At infinity	At F	Virtual, erect	Highly diminished
Between infinity and O (center)	Between F and O	Virtual, erect	Diminished

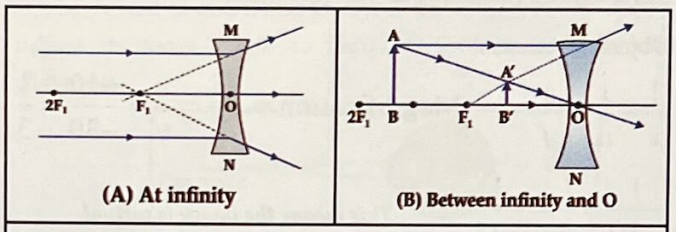


Fig 6: Image Formed by Concave Lens

Lens Formula $= \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

f = Focal length of lens

v = Image distance from the lens

u = Object distance from the lens

Magnification $(M) = \frac{-v}{u}$

M = 1 (Image size = Object size)

M > 1 (Image is larger than object)

M < 1 (Image is smaller than object)

Uses of Lenses

• *Convex lens:* Used in eyeglasses to correct hypermetropia (farsightedness), magnifying glasses, microscopes, cameras, telescopes.

• *Concave lens:* Used in eyeglasses to correct myopia (nearsightedness)

Power of Lens

• Power of a lens is the reciprocal of its focal length (in meters).

$$\text{Power}(P) = \frac{100}{f_{(cm)}} = \frac{1}{f_{(m)}}$$

S.I. Unit of Power

• The SI unit of power is the *dioptre (D)→1D = 1m^{-1}*.

Sign Convention

• Convex lens (converging) → *Positive power.*

• Concave lens (diverging) → *Negative power.*

Questionnaire

A concave lens has focal length of 15 cm . At what distance should the object from lens should be placed so that it forms an image at 10 cm from the lens? Also find the magnification of lens.

Sol: Given

Focal length, f = –15cm (concave lens → focal length is negative)

Image distance, v = –10cm (virtual image formed on the same side as the object → also negative)

Object distance, u = ?

$$\frac{1}{v}-\frac{1}{u}=\frac{1}{f} \qquad \text{Magnification} = \frac{hi}{h_o}=\frac{v}{u}=\frac{-10}{-30}=\frac{1}{3}$$

$$\frac{1}{-10}-\frac{1}{u}=\frac{1}{-15}$$

This means the image is virtual, erect, and 1/3 the size of the object (diminished).

$$\frac{1}{u}=\frac{1}{-10}-\frac{1}{-15}$$

$$\frac{1}{u}=\frac{-1}{10}+\frac{1}{15}$$

$$\frac{1}{u}=\frac{-3+2}{30}$$

$$\frac{1}{u}=-\frac{1}{30}$$

$$u=-30\ \text{cm}$$

Questionnaire

If the focal length of a convex lens is 5cm, concave lens is 10 cm, and convex lens is 2 cm respectively. What power do we get after adding all the focal length?

Sol: Given

f of convex lens = +5 cm

f of concave lens = –10 cm

f of convex lens = +2 cm

$$P_1=\frac{100}{5}=+20\text{D}$$

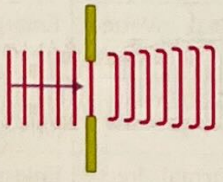
$$P_2=\frac{100}{-10}=-10\text{D}$$

$$P_3=\frac{100}{+2}=+50\text{D}$$

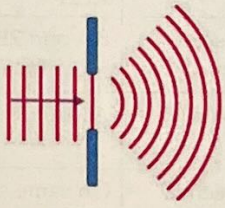
$$P_{\text{total}}=P_1+P_2+P_3=20+(-10)+50=60\text{D}$$

Diffraction

• Diffraction is the ***bending or spreading of light*** (or any wave) around the edges of an obstacle or through a small opening.

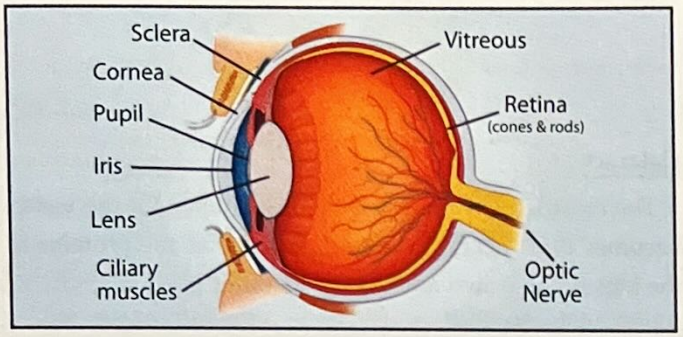


Wide Gap
Small diffraction effect



Narrow Gap
Large diffraction effect

HUMAN EYE



Cornea

- It is the transparent and front part of human eye.
- It is responsible for the majority of the *refraction* (bending) of light as it enters the eye.
- In *eye donation*, only cornea is used, not the entire eye.

Aqueous Humour

- It is the clear fluid between cornea and lens.
- It maintains pressure, nourishes the cornea and lens.

Iris *(dark muscular diaphragm)*

- It is the coloured part of the eye that surrounds the pupil.
- It controls the size of the *pupil*.

Pupil

- It is a black circular opening in the center of the iris.
- It regulates the *amount of light* entering the eye.

Lens

- It is transparent and flexible structure.
- It focuses *light ray onto the retina* by changing shape *(accommodation).*

Vitreous Humour

- It is jelly-like substance filling the inside of the eye.
- It helps in maintaining the eye shape.

Retina

- It is a *light-sensitive layer* at the back.
- It is the spot where image is formed.
- In retina, optical energy is converted into electrical energy by *photoreceptor cells.*

Two types of photoreceptor cells:

- *Rods* (black and white/night vision).
- *Cones* (colour and daytime vision).

Blind Spot

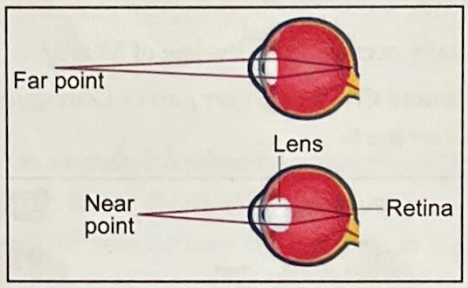
- The blind spot in your eye is the point in the retina where the optic nerve exits the eye.
- This area has *no light-sensitive cells,* so it cannot detect light.

Optic Nerve

- The optic nerve is a bundle of nerve fibers that *transmits visual information* from the *eye to the brain.*

Power of Accommodation

- The power of accommodation is the *ability of the eye to adjust its focal length* to focus on objects at different distances.

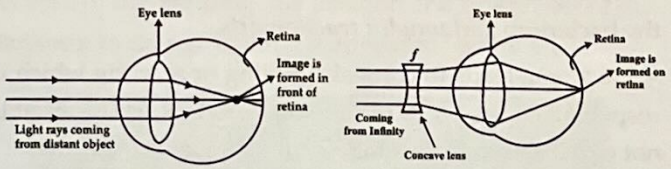


- *The ciliary muscles contract to thicken the lens, which increases its refractive power and allows the eye to focus on nearby objects.*
- *The ciliary muscles relax to flatten the lens, which decreases its refractive power and allows the eye to focus on distant objects. This is known as power of accommodation.*
- *The least distance of distinct vision is 25 cm.*

Defects of Eye

Myopia/Nearsightedness

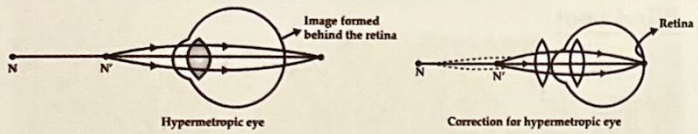
- Myopia also known as *nearsightedness,* which means that you can see objects that are near clearly but have difficulty seeing objects that are farther away.
- To correct myopia, *Concave lens (-ve power lens)* is used.



- *Focal length decreases and power increases.*
- *Image is formed in front of the retina.*

Hypermetropia/Far Sightedness

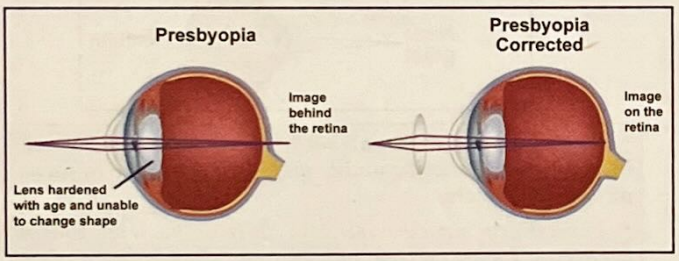
- Hypermetropia means *farsightedness* which means that you can see objects that are far away but have difficulty seeing objects that are close.
- It usually occurs above the age of *40 years.*
- To correct hypermetropia, *Convex lens (+ve power lens)* is used.



- *Image formed behind the retina.*
- *Light focuses behind the retina instead of focusing on the retina.*

Presbyopia

- Presbyopia is the gradual loss of your eyes' ability to focus on *nearby objects.*
- In presbyopia, the lens of the *eye hardens with age* (loses flexibility).
- It usually occurs above the age of *50 years.*
- Correction: *Concave (upper part) + Convex lens or bifocal lens (lower part).*



Glaucoma

- Glaucoma is an eye condition that damages your eye's *optic nerve.*
- This causes the eye pressure to increase, leading to permanent vision loss.
- Glaucoma is generally *hereditary* (not curable).

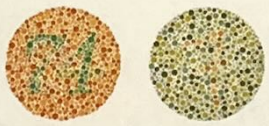
Trachoma

- Trachoma is a disease of the eye caused by infection with the bacterium *Chlamydia trachomatis.*
- Trachoma leads to corneal clouding or scarring which is responsible for *irreversible vision loss.* The disease itself is not curable in the later stages.

Tonometry is an eye exam that measures the pressure inside your eyes, or intraocular pressure (IOP). It is used to screen for glaucoma and monitor how well glaucoma treatments are working.

Colour Blindness

- Colour blindness (or colour vision deficiency) is a condition where a person has difficulty seeing certain colours correctly.
- It is a *hereditary* condition.
- It happens when cone cells in the retina (which detect colour) are missing or not working properly.



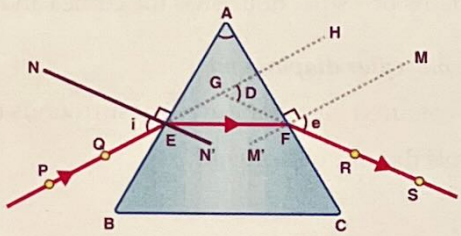
Cataract

- The clear lens of the eye becomes *cloudy* and the vision becomes *blurry.* This clouding happens as the proteins in the lens break down and clump together.

LIGHT

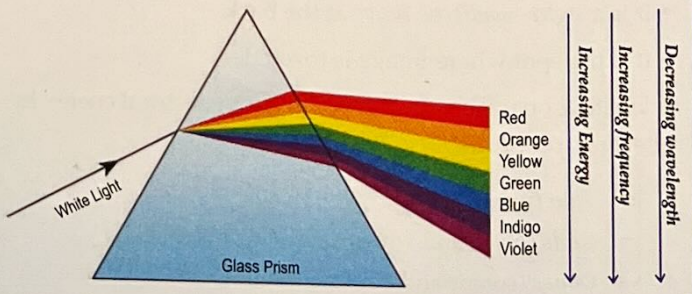
Refraction of Light through a Prism

- When light passes through a prism, it undergoes refraction, which means it bends as it *changes speed moving from one medium* (like air) to another (glass). This bending occurs because light travels at different speeds in different media.
- More wavelength = Less deviation.



Dispersion of White Light through Prism

- Dispersion is the process by which *white light splits into its constituent colours* when it passes through a glass prism.
- White light is made up of seven colours: *Violet, Indigo, Blue, Green, Yellow, Orange, and Red (VIBGYOR).* When it passes through a glass prism, it slows down and bends due to *refraction,* as glass is denser than air.
- Each colour has a different wavelength and bends at a different angle → *violet bends the most* and *red bends the least.*
- This difference in bending causes the light to spread out into a band of colours, forming a visible spectrum.

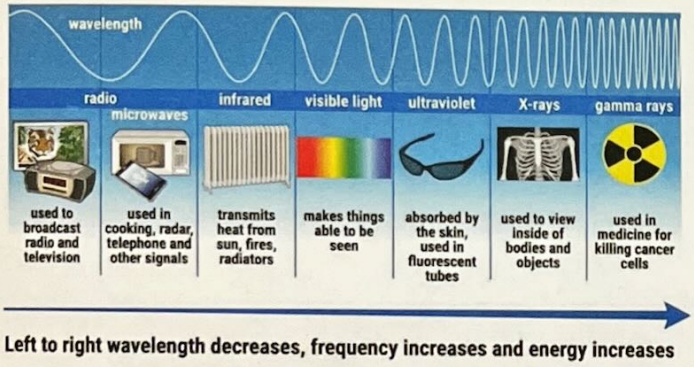


- *Red light : More speed → less refractive index*
- *Violet light : Less speed → more refractive index*
- *Red light has maximum wavelength hence it deviates the least.*
- *Violet light has minimum wavelength hence it deviates the most.*

$$\text{Refractive Index } (n) = \frac{\text{Speed of light in air}}{\text{Speed of light in prism}}$$

Electromagnetic Spectrum

• The electromagnetic spectrum is the complete range of electromagnetic waves arranged according to their wavelength or frequency. These waves all travel at the speed of light in a vacuum (3×10^8 m/s) but differ in their energy and applications.



Left to right wavelength decreases, frequency increases and energy increases

TRICK TO REMEMBER

Decreasing wavelength order →

Rich	*Man*	*In*	*Victoria*	*Uses*	*Xtra*	*Gold*
Radio waves	*Micro waves*	*Infrared*	*Visible light*	*UV rays*	*X-ray*	*Gamma rays*

Radiation	*Discovered By*
Radio waves	Heinrich Hertz (late 1880s)
Microwaves	Percy Spencer (1945)
Infrared rays	William Herschel (1800)
Visible light	Isaac Newton (1600s)
UV rays	Johann Wilhelm Ritter (1801)
X-rays	Wilhelm Roentgen (1895)
Gamma rays	Paul Villard (1900)

Planck's Constant

• Planck's constant is a fundamental constant in quantum physics that relates the energy of a photon to its frequency.

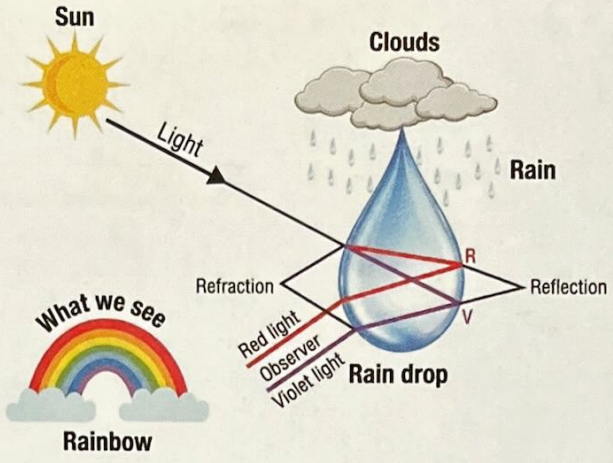
$$E = hf$$
$$E = \frac{hc}{\lambda}$$

$h = 6.626 \times 10^{-34}$ *J-sec*

E = Energy of the photon (in joules, J)
h = Planck's constant
f = Frequency of the radiation (in hertz, Hz)
c = Speed of light
λ = Wavelength
Energy of a photon is directly proportional to its frequency and inversely proportional to its wavelength.

Rainbow Formation

• A rainbow is formed due to the *refraction (two), dispersion, and reflection of sunlight in water droplets* present in the atmosphere.



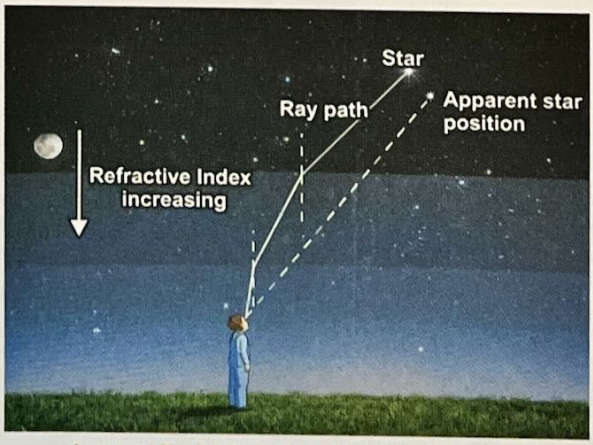
• Sunlight enters a raindrop and bends (refracts) because water is denser than air. Inside the drop, the *light splits into its 7 colours (VIBGYOR)* because each colour bends at a slightly different angle. The light reflects off the inside surface of the raindrop. As it exits the drop, the light bends again, and the colours spread out more.

Refraction in Atmosphere

Twinkling of Stars

• The twinkling of stars is caused by the *refraction of light* as it passes through the Earth's atmosphere.

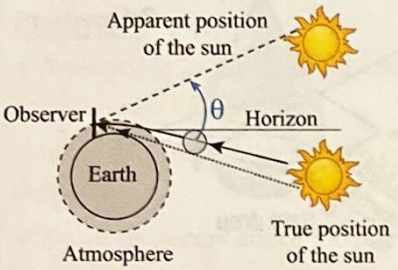
• Starlight passes through Earth's atmosphere before reaching our eyes. The atmosphere is made up of many layers of air with varying temperatures and densities. As the light passes through these layers, *it bends (refracts) continuously* and slightly differently every moment. Because of this bending, the position and brightness of the star seem to change making it appear to "twinkle".



Apparent Star Position due to Atmospheric Refraction

Advanced Sunrise and Delayed Sunset

Advanced sunrise and delayed sunset are both caused by the *refraction of sunlight in Earth's atmosphere.* Due to atmospheric refraction, we see the sun a little earlier before it actually rises (advanced sunrise), and a little longer after it sets (delayed sunset). This happens because the *Earth's atmosphere bends the sunlight, making the sun appear slightly higher than it really is.*



Alpenglow is a natural phenomenon where mountains appear to glow with a rosy or reddish hue, typically around sunrise or sunset.

Scattering of Light

• Scattering of light happens when *light hits small particles* (like dust, water droplets, or gas molecules) in the atmosphere and changes direction.

Blue Colour of the Sky

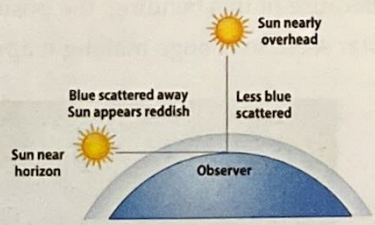
Rayleigh talked about the scattering of light in 1871.

• Shorter wavelengths (blue/violet) *scatter more* (travels as shorter or smaller waves) than longer wavelengths (red). That's why the sky looks blue during the day (blue light is scattered in all directions).

Our sky appears black without atmosphere.

Red Colour of Sun during Sunrise/Sunset

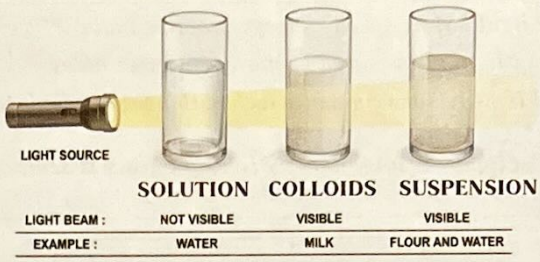
• During sunrise and sunset, the sun is *low on the horizon,* so its light has to *travel a longer distance* through the Earth's atmosphere. In this long path, shorter wavelengths like blue and violet are scattered away, while red light, which scatters the least, manages to reach our eyes. That's why the sky appears reddish-orange during these times.



Tyndall Effect

• The Tyndall effect is the scattering of light by particles in a *colloid* or *suspension*, which makes the light beam visible.

• Light rays hit the particles in a colloid, these particles scatter the light in all directions. The scattered light makes the path of the light beam visible.



Danger Signals in Red

• Danger signals are often in red because it has the *longest wavelength* and *scatters the least,* making it visible from a distance even in poor visibility conditions like fog or smoke. *Additionally, red naturally catches attention and signals alert or warning, making it the ideal colour for danger signals.*

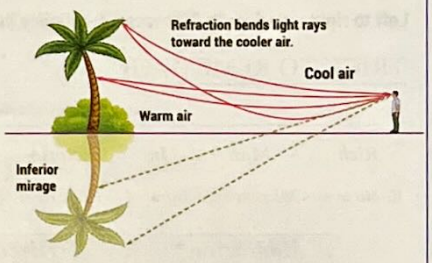
Total Internal Reflection(TIR)

• Total internal reflection is a phenomenon where light, traveling from a *denser medium to a less dense medium,* is reflected back into the denser medium instead of being refracted. ***E.g. Mirage, optical fibres, etc.***

• This phenomenon is also responsible for *optical illusions.*

Conditions of Total Internal Reflection

• Light should travel from denser to rarer medium.



• Angle of incidence must be greater than the critical angle (The critical angle is the minimum angle of incidence at which light is totally reflected inside the denser medium).

A mirage is an optical illusion caused by the refraction of light through layers of air at different temperatures. On a hot day, the layer above the ground gets warm. The light ray gets refracted when light moves through the cold air and into the hot layer.

Diamond sparkles due to TIR.

Uses of Optical Fibres

• Optical fibers have a wide range of uses, primarily in telecommunications, computer networking, and medical applications.

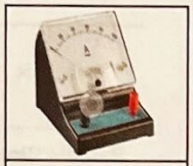
ELECTRICITY

Electric Current (represented by "I")

- Electric current is the rate of flow of electrons in a conductor. The SI Unit of electric current is the *Ampere*.
- Electric current is also expressed as the *flow of charge per unit time or flow of electrons per unit time (1e-=1.6×10^{-19} Coulomb).*
- It is measured by *Ammeter.*

$$I\ (\text{Electric Current}) = \frac{q\ (\text{Charge})}{t\ (\text{Time})}$$

$$q = I \times t$$



An Ammeter

$q = n \times e^-$

$1\ C = n \times 1.6 \times 10^{-19}$

$n = \frac{1}{1.6 \times 10^{-19}}$

$= 6.25 \times 10^{18}\ e^-$

$n \approx 6 \times 10^{18}\ e^-$

Coulomb is the S.I. unit of Charge.

q = Total charge (in Coulombs)
n = No. of electrons
e$^-$ = Charge of a single e$^-$ (1.6 x 10^{-19} C)

Conductor

- A conductor is an object or type of material that allows the *flow of charge* (electric current) in *one or more directions.*

Potential Difference

- Potential difference is the amount of *work done in moving a unit positive charge* from one point to other in an electric field. The S.I. unit of potential difference is *Volt*.
- It is measured using a *Voltmeter.*

$$V = \frac{W}{q}$$

1 Volt: It is the amount of energy needed to move a unit charge from one point to another.

$$1\ V = \frac{1J}{1C}$$

Ohm's Law

- The Ohm's Law states that "The current flowing in a conductor is directly proportional to the voltage across the conductor, provided that all the physical condition and temperature remain constant".
- Ohm's Law is given by *George Simon Ohm* in *1827*.

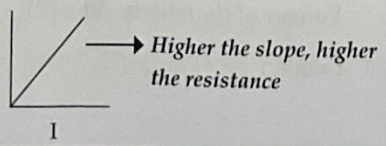
• Ohm's law can be rewritten in three different forms:

$V \propto I$

V = Voltage
I = Current
R = Resistance

When voltage increases, current generally also increases, assuming the resistance and temperature remain constant.

1. $V = IR$
2. $R = \frac{V}{I}$
3. $I = \frac{V}{R}$

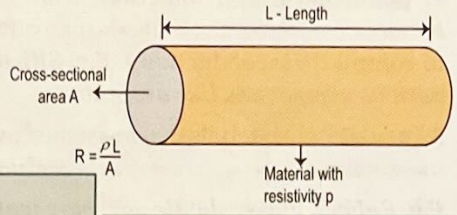


Higher the slope, higher the resistance

Resistance

- Resistance is defined as the property of an electrical component to *resist the flow of electric current.* The S.I. unit of resistance is *Ohm (Ω).*

$$R = \rho\frac{L}{A}$$



R = Resistance
ρ = Resistivity of the material
L = Length of the conductor
A = Area of cross-section

Resistivity (ρ)/Specific Resistance
- *The resistivity of a material is a measure of how strongly a material opposes the flow of electrical current.*
- *Resistivity is constant.*

Factors Affecting Resistance

1. Length of the Conductor (L)

- Resistance is directly *proportional to length.*

$$R \propto L$$

- A longer conductor *offers more resistance* due to increased *collisions* between electrons and ions.

E.g. A wire twice as long will have twice the resistance.

2. Area of Cross-Section (A)

- Resistance is inversely proportional to the area of cross-section.

$$R \propto \frac{1}{A}$$

- A thicker conductor has a *lower resistance* because *electrons have more space to flow with fewer collisions.*

E.g. A wire with a larger diameter offers less resistance.

3. Temperature (T)

- For metallic conductors, *resistance increases with temperature.* This happens because atoms vibrate more at higher temperatures, increasing collisions (increase movement of electrons and K.E.).
- For semiconductors, *resistance decreases with temperature.*

Note: The temperature-resistance relationship depends on the material.

4. Nature of the Material (Resistivity)

- Different materials have different *intrinsic resistivities.*
- Lower resistivity → better conductor *(E.g. copper, silver).*
- Higher resistivity → poorer conductor or insulator *(E.g. rubber, plastic).*

$\Omega = \rho\frac{m}{m^2}$

$\Omega m = \rho$

S.I. unit of resistivity = Ωm or ohm per meter.

$R \propto L$

$R \propto \frac{1}{A}$

$R \propto \frac{L}{A}$

$R \propto \frac{\rho L}{A}$

Conductance (Symbol: G):
It measures how easily electricity flows through a component. The S.I. unit of conductance is Siemens (S).

Materials are classified into:

1. **Conductors:** Materials that readily allow the flow of electric current, exhibiting *high electrical conductivity* and *low resistivity*. ***E.g. Copper, silver, gold, aluminum, steel.***

2. **Semiconductors:** Materials with *conductivity values between conductors and insulators,* offering the possibility to control their conductivity. ***E.g. Silicon, germanium, and various compounds like arsenide.***

3. **Insulators:** Materials that resist the flow of electric current, *having high electrical resistivity* and *low conductivity.*

E.g. Rubber, glass, plastic, air, pure water.

	Material	Resistivity (Ω m)
Conductors	Silver	1.60×10^{-8}
	Copper	1.62×10^{-8}
	Aluminium	2.63×10^{-8}
	Tungsten	5.20×10^{-8}
	Nickel	6.84×10^{-8}
	Iron	10.0×10^{-8}
	Chromium	12.9×10^{-8}
	Mercury	94.0×10^{-6}
	Manganese	1.84×10^{-6}
Alloys	Constantan (alloy of Cu and Ni)	44×10^{-6}
	Manganin (alloy of Cu, Mn and Ni)	100×10^{-6}
	Nichrome (alloy of Ni, Cr, Mn and Fe)	
Insulators	Glass	$10^{10} \times 10^{14}$
	Hard rubber	$10^{13} \times 10^{16}$
	Ebonite	$10^{15} \times 10^{17}$
	Diamond	$10^{12} \times 10^{13}$
	Paper (dry)	10^{12}

Table 1: Material and Resistivity

Alloy has greater resistivity than its constituent metals

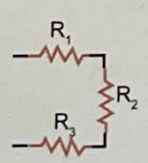
Resistance Combination

- In electrical circuits, resistors can be connected in two primary ways: *Series and Parallel.*

Series Connection

- In a series circuit, resistors are connected *end-to-end, forming a single path* for current flow.
- Current (I) is the *same* through each resistor.
- Voltage (V) is *divided across each resistor* depending on its resistance.

$$Req = R_1 + R_2 + R_3 + \ldots + R_n$$

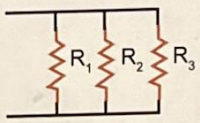


Series Circuits

- *Where, R1, R2, R3 ... Rn are individual resistor value.*
- *Same current, different potential difference.*

Parallel Connection

- In a parallel circuit, resistors are *connected across the same two points,* creating *multiple paths* for current flow.
- Voltage (V) is the *same* across each resistor.
- Current (I) is *divided* based on the resistance of each branch.



Parallel Circuit

$$\frac{1}{Req} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots + \frac{1}{R_n}$$

- *Same potential difference. different current.*

- Appliances in our home are connected in Parallel Connection.

Questionnaire:

Two resistors of 20Ω and 4Ω respectively are connected in series connection to a 6V battery, what is the current flow?

Sol:

Given

$R_1 = 20\,\Omega$

$R_2 = 4\,\Omega$

Voltage of the battery (V) = 6V

Connection = Series

In a series connection:

$$Rtotal = R_1 + R_2 = 20\,\Omega + 4\,\Omega = 24\,\Omega$$

$$I = \frac{V}{R}$$

$$I = \frac{6V}{24\Omega}$$

$$I = 0.25A$$

Questionnaire:

Three resistors of 5Ω, 10Ω, and 30Ω respectively are connected in parallel connection with a potential difference of 12V, what is the current flow?

Sol:

Given

$R_1 = 5\,\Omega$

$R_2 = 10\,\Omega$

$R_3 = 30\,\Omega$

Voltage of the battery (V) = 12V

Connection = Parallel

In a parallel connection:

$$\frac{1}{Req} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}$$

$$\frac{1}{Req} + \frac{1}{5} + \frac{1}{10} + \frac{1}{30}$$

$$\frac{1}{Req} = \frac{1+3+1}{30}$$

$$Req = 3\Omega$$

$$V = IR$$

$$12 = Ix3$$

$$I = 4\,A$$

Heating Effect of Electric Current

- When an electric current flows through a conductor, it produces *heat due to the resistance of the conductor.* This phenomenon is called the heating effect of electric current.

Heating effect of electric current was given by James Prescott Joule in 1840.

Joule's Law of Heating

- The heat produced in a resistor due to the flow of current is given by:

$$Heat\ (H) = I^2Rt$$

Alternate Forms:

Using Ohm's Law (V = IR), the formula can also be written as:

$$H = VIt \text{ or } H = \frac{V^2t}{R}$$

Where:

- *H = Heat energy (in joules)*
- *I = Current (in amperes)*
- *R = Resistance (in ohms)*
- *t = Time (in seconds)*

Applications of Heating Effect of Electric Current

Application	*Details*
Electric Heater	Nichrome wire used as heating element
Electric bulb	Tungsten filament (high melting point)
Electric iron	Uses the heating effect to iron clothes
Fuse	Thin wire with low melting point to protect appliances

Important Notes:

- Nichrome is commonly used in heating devices because it has *high resistance* and it *does not oxidize* easily at high temperatures.
- A fuse melts when *excessive current flows,* breaking the circuit and preventing damage. It is used to protect electrical appliances from excessive current and to prevent *short circuits* or *mismatched loads.*

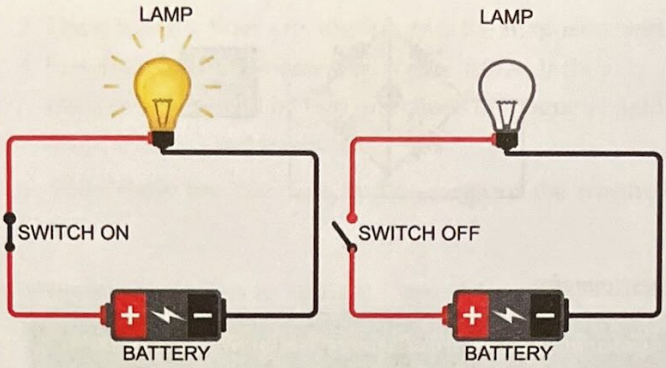


Fig. 1: Open and Closed Circuit

Electric Power: Electric power is the rate at which electrical energy is consumed or produced.

$$P = VI$$

$$P = I^2R \rightarrow (\because V = IR)$$

$$P = \frac{V^2}{R}$$

V = Voltage
I = Current
R = Resistance

Commercial Unit of Energy → kWh

1 unit = 1kWh

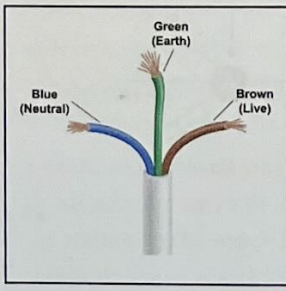
1 kWh = 1 kW × 1 hour = 1000 watts × 3600 secs = 3,600,000 watt-seconds or joules

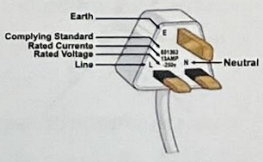
$= 36 \times 10^5$ *Ws*

$= 3.6 \times 10^6$ *J*

Colour Coding in Household Wiring

- Live wire: Red (high voltage)
- Neutral: Black (V = 0)
- Ground/Earth: Green/Yellow
- In electrical appliances: 220V; 50Hz

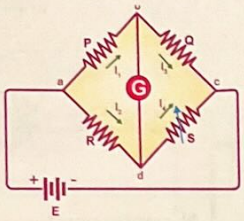




Earth wire is made thick such that it can manage higher currents with low resistance

Wheatstone Bridge:

• A Wheatstone bridge is an electrical circuit used to accurately measure an ***unknown resistance*** by balancing two legs of a bridge circuit using 4 resistors.



$$\frac{P}{R} = \frac{Q}{S}$$

Questionmaire:

Calculate the electrical energy consumed by a 1200 W toaster in 30 mins. What will be the cost of using the same for 1 month if 1 unit of electricity cost Rs. 4?

Sol: *Given*

Power of toaster = 1200 W = 1.2 kW
Time used = 30 minutes = 0.5 hours
Cost of 1 unit (1 kWh) = Rs. 4
Usage= 1 time/day for 30 days
Energy = Power ×Time = 1.2 kW × 0.5 hr
= 0.6 units (kWh)
Monthly Energy = 0.6 × 30 = 18 units
Cost = 18 × 4 = Rs. 72
Energy consumed per day = 0.6 units
Total energy for 30 days = 18 units
Cost for 1 month =Rs. 72

Kirchhoff's Law

1. *Law of Current:* It states that the total current entering a node (junction) in a circuit is equal to the total current leaving that node.

$$\Sigma I_{In} = \Sigma I_{Out}$$

2. *Law of Voltage:* The sum of all voltages (EMFs and voltage drops) around any closed loop in a circuit is equal to zero *(ΣV = 0)*.

$$I_1 + I_5 = I_2 + I_3 + I_4$$

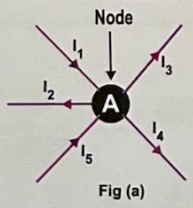


Fig (a)

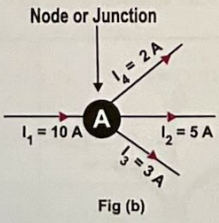


Fig (b)

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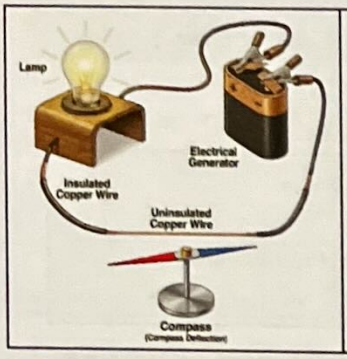
MAGNETIC EFFECT OF AN ELECTRIC CURRENT

• The magnetic effect of electric current is the phenomenon where an electric current flowing through a conductor produces a magnetic field around it. This field can exert force on other magnets or moving charges.

E.g. Deflection of a compass needle placed near a current-carrying wire.

• ***The strength of the magnetic field increases with the amount of current flowing through the wire.***



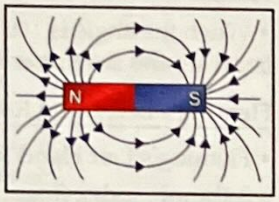
• The direction of magnetic field changes due to a change in direction of current in the wire.

• ***Hans Christian Oersted*** discovered the magnetic effect of electric current in ***1820.***

Magnetic Field Lines

• The magnetic field created by a current-carrying wire is a force field that influences other magnets and moving charges.

• When iron filings are scattered around a magnet, they become ***temporary magnets*** through magnetic induction and align end-to-end along the magnetic field lines. The filings clump more densely near the poles, showing that the magnetic field is the ***strongest near the poles.*** This pattern of filings gives a clear visual impression of the magnetic field around the magnet.



• ***Like poles repel each other and Unlike poles attract each other.***

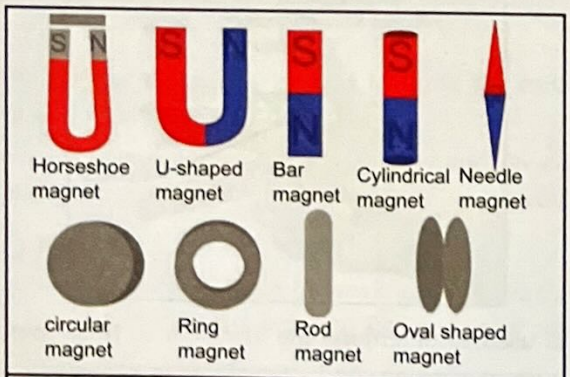


Fig 1: Types of Magnets

Properties of a Magnetic Field Lines

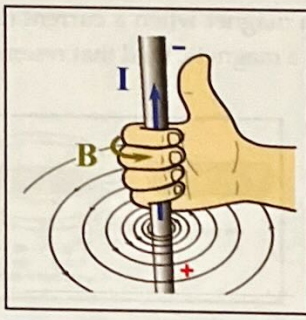
1. They always go from the ***north pole to the south pole*** outside the magnet.
2. Inside the magnet, they go from the south pole to the north pole, forming ***closed loops.***
3. The closer the lines are, the ***stronger*** the magnetic field.
4. Magnetic field lines ***never cross each other.*** If they intersect, there will be two directions of magnetic field lines, which is not possible.
5. They show the ***direction*** and ***strength*** of the magnetic field.

Magnetic Field Due to Straight Current Carrying Conductor

• The magnetic field around a straight current-carrying conductor consists of concentric circles centered on the wire.

• These circular magnetic field lines form around the wire when electric current flows through it.

• The direction of the field can be found using the ***Right-Hand Thumb Rule*** → if you point your right thumb in the direction of the current, your fingers will curl in the ***direction of the magnetic field lines.***



Right-Hand Thumb Rule

$$\text{Magnetic Field} \propto \frac{1}{\text{Distance}}$$

→ As you go ***farther*** from the wire, the magnetic field becomes ***weaker.***

• Magnetic Field ∝ Current

→ A stronger current produces a stronger magnetic field.

• *Change in Current Direction → Change in Magnetic Field Direction*

→ If current flows ***downward,*** the magnetic field become ***clockwise.*** If the current flows ***upward,*** the magnetic field lines become ***anti-clockwise.***

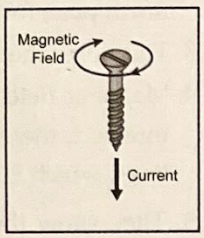
• ***Increasing the number of loops/turns in a current-carrying wire coil strengthens the magnetic field. E.g. On doubling the number of turns the magnetic field also doubles.***

Maxwell's Screw Rule

• Maxwell's screw rule is a way to find the direction of the magnetic field around a current-carrying conductor.

Rule:

• Imagine turning a right-handed screw (or corkscrew) in the direction of the current. Then, the direction in which the screw rotates gives the direction of the magnetic field lines.



Ampere's Law

Ampere's Law essentially states that *"The line integral of the magnetic field around a close loop is proportional to the total current passing through the loop"*. It is used to calculate the magnetic field in various configurations, such as around straight wires or solenoids.

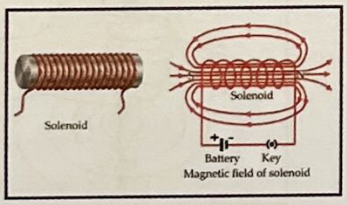
$$\int B.dl = \mu_0 I$$

Magnetic Field Due to a Current Carrying Solenoid

• The magnetic field *inside* a solenoid is *uniform* and *strongest* in the *center.*

• For a long, ideal solenoid (where the length is much greater than the radius), the magnetic field *outside* is considered to be *zero*.

• A solenoid behaves like a magnet when a current flows through it because it creates a magnetic field that resembles that of a *bar magnet.*

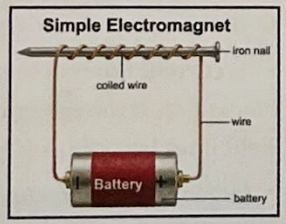


• When current flows through the coils of a solenoid, each turn of the coil generates its own magnetic field. These fields combine to create a strong, relatively uniform magnetic field inside the solenoid.

• If the direction of *current is reversed,* the direction of *magnetic field is also reversed.*

Electromagnet

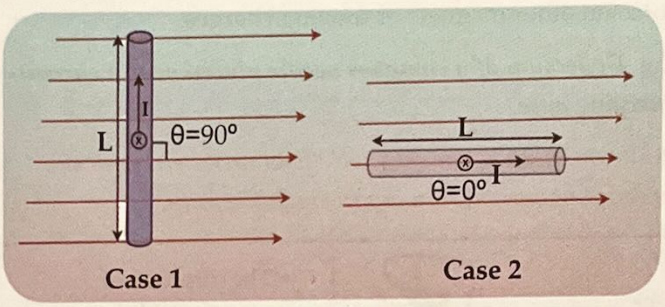
• An electromagnet is a temporary magnet, meaning it only exhibits magnetic properties when an electric current is flowing through its coil, and *loses its magnetism when the current is switched off.*



• If a soft iron core is placed inside this coil, the magnetic field from the coil will induce magnetism in the soft iron. The induced magnetism is *temporary.* As long as the current flows, the soft iron remains magnetized. *Once the current stops, the soft iron loses its magnetism.*

Force on a Current Carrying Conductor in a Magnetic Field

• A current-carrying conductor experiences a force when placed in a magnetic field. This force is caused by the interaction between the magnetic field generated by the current in the conductor and the external magnetic field.



$$\vec{F} = I(\vec{L} \times \vec{B})$$

$\vec{F}$: *Magnetic force on the conductor.*
I: Current in the conductor.
$\vec{L}$: *Length of the conductor in direction current.*
$\vec{B}$: *Magnetic field.*

• If the angle between L and B is 0, then: $F = ILB \sin\theta$.

Conditions:

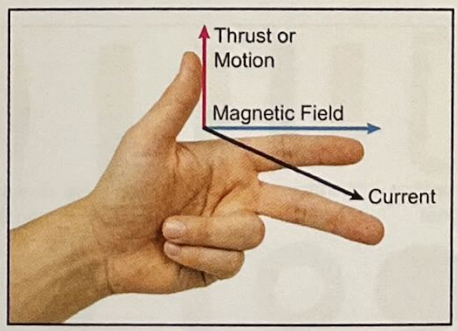
• The maximum force is experienced when the angle is *90°,* because the *$\sin\theta$ becomes 1,* which is the *maximum value.*

• When the angle is *0°*, the force experienced is *zero* because *$\sin\theta$ is zero.*

• When the angle is *180°*, the force experienced is also *zero* because sinθ is again zero.

Fleming's Left Hand Rule

• Fleming's Left Hand Rule states that "If you extend your left thumb, index finger, and middle finger at right angles to each other, the thumb points in the direction of the force, the index finger points in the direction of the magnetic field, and the middle finger points in the direction of the current".

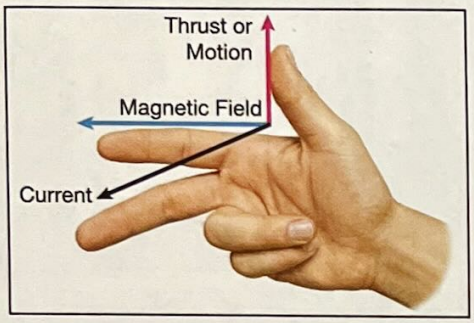


• It is used to determine the *direction of force* (motion) on a current carrying conductor placed in a magnetic field.

E.g. Motor (electrical energy is converted to mechanical energy) works on the principle of Fleming's Left Hand Rule.

Fleming's Right Hand Rule

• Fleming's Right-Hand Rule helps determine the *direction of induced current in a generator* (mechanical energy is converted into electrical energy). It uses the right hand where the thumb indicates the direction of motion, the first finger (forefinger) indicates the magnetic field, and the second finger (middle finger) indicates the direction of induced current.

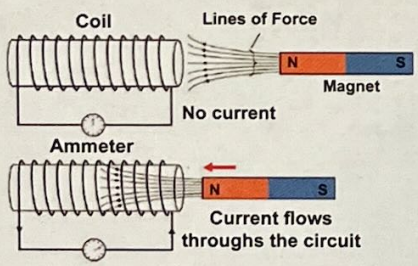


Electromagnetic Induction

• Electromagnetic Induction is a phenomenon in which current is produced because of *voltage production* (electromotive force) due to a changing magnetic field.

• This either happens when a conductor is placed in a moving magnetic field (when using an AC power source) or when a conductor is constantly moving in a stationary magnetic field.

• Electromagnetic induction was discovered by *Michael Faraday* in *1831.*



• When the bar magnet is pushed towards the coil, the pointer in the galvanometer deflects.

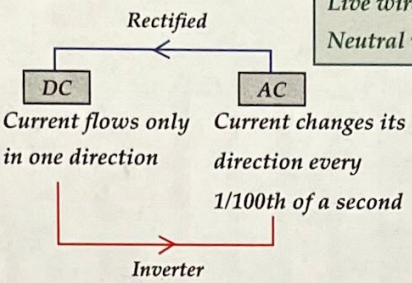
• The *relative motion between the magnet* and *the coil* is responsible for generation of electric current in the coil.

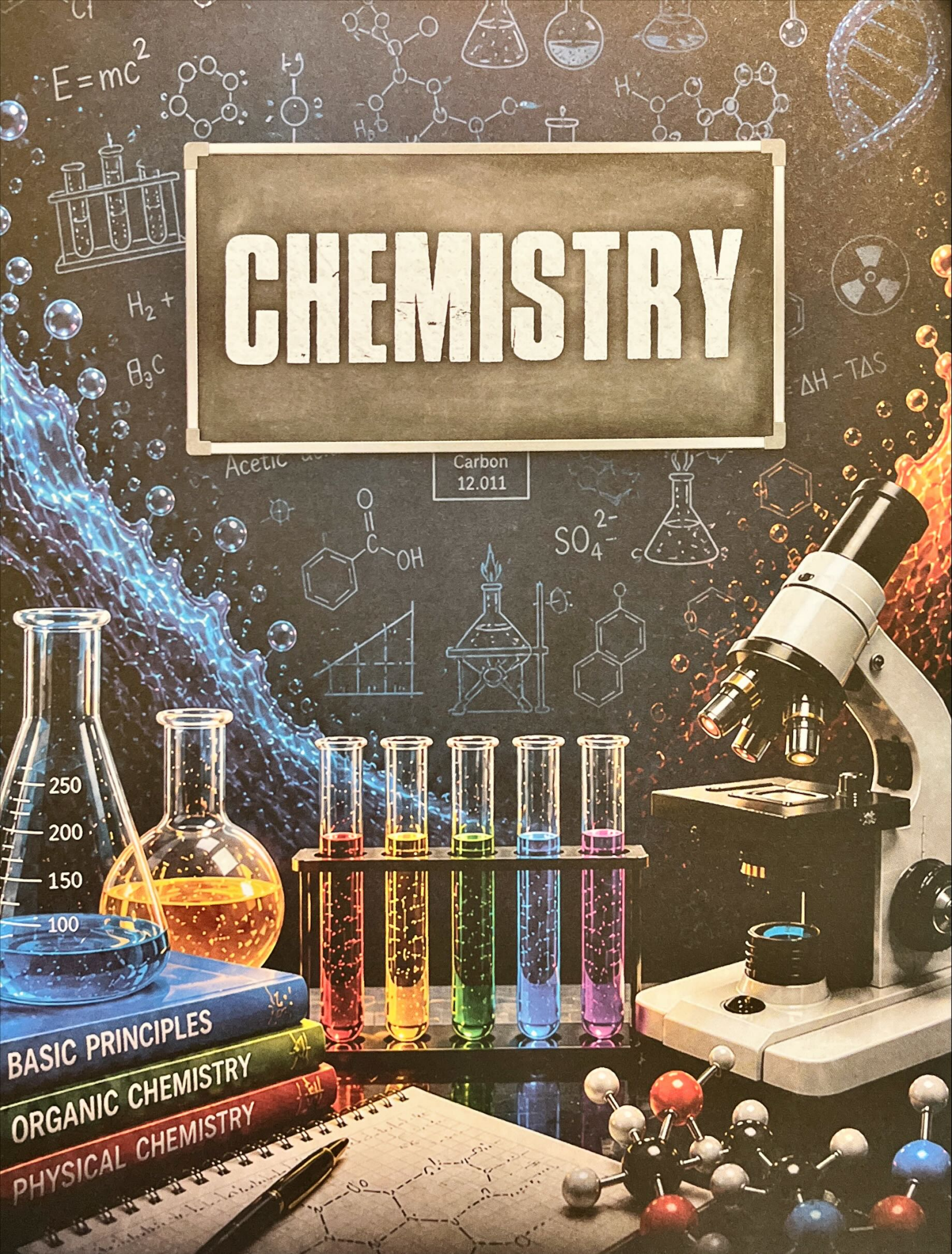
Short Circuit

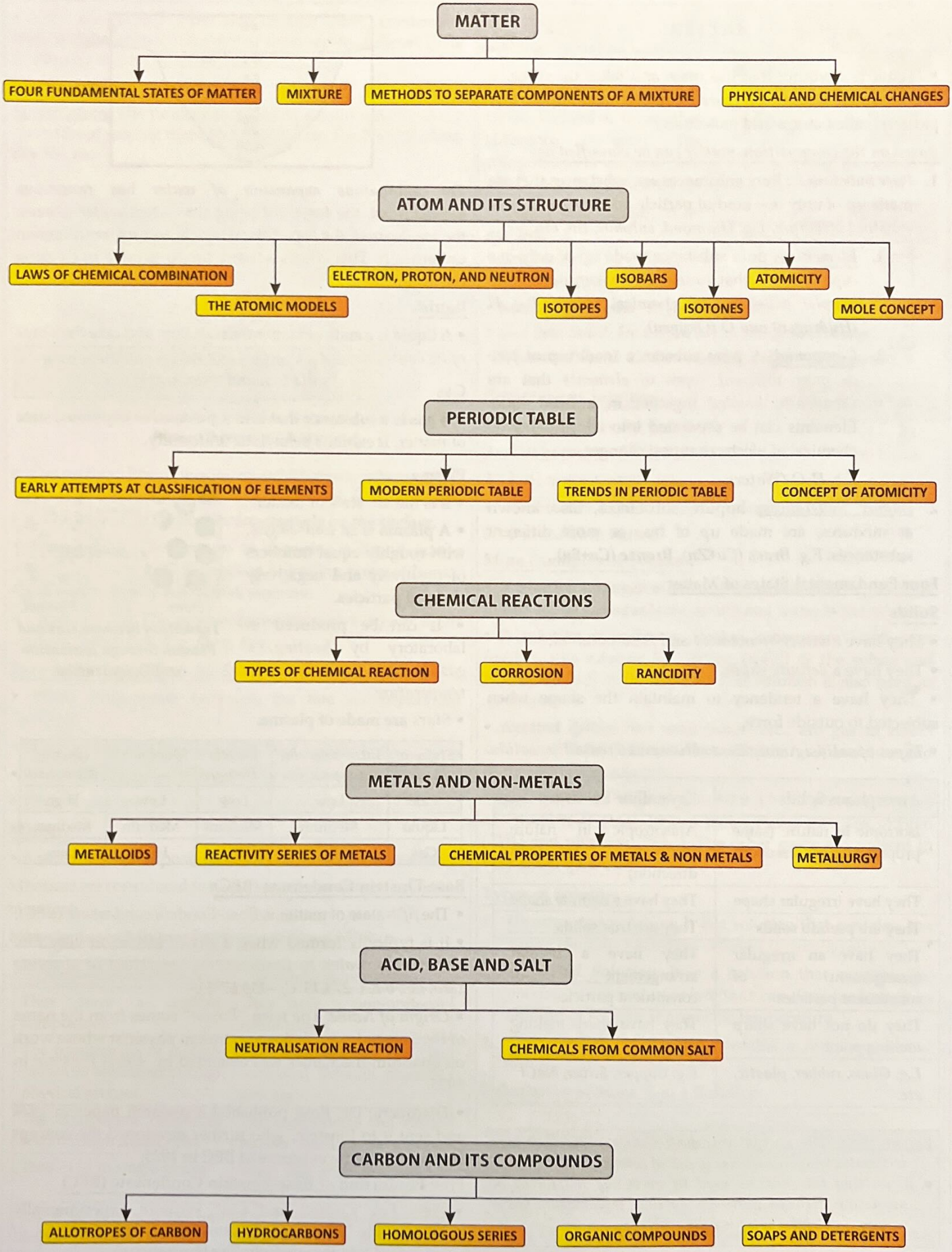
• Short Circuit is caused due to *breaking of insulation of wires,* forming the contact between live wire and neutral wire.

• During a short circuit, the current in a circuit increases abruptly and significantly. This is because a short circuit creates a very *low resistance path,* allowing a large amount of current to flow.

Live wire: red colour (220V)
Neutral wire: black colour (0V)




CHEMISTRY
$E=mc^2$
H_2+
H_3C
$\Delta H - T\Delta S$
Carbon
12.011
SO_4^{2-}
250
200
150
100
BASIC PRINCIPLES
ORGANIC CHEMISTRY
PHYSICAL CHEMISTRY


MATTER
FOUR FUNDAMENTAL STATES OF MATTER
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METHODS TO SEPARATE COMPONENTS OF A MIXTURE
PHYSICAL AND CHEMICAL CHANGES
ATOM AND ITS STRUCTURE
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CARBON AND ITS COMPOUNDS
ALLOTROPES OF CARBON
HYDROCARBONS
HOMOLOGOUS SERIES
ORGANIC COMPOUNDS
SOAPS AND DETERGENTS

MATTER

• Matter is anything that has mass and takes up space. It can be solids, liquids, or gases. Matter is made up of tiny particles called atoms and molecules.

Based on the composition, matter can be classified as:

1. ***Pure Substances:*** Pure substances are substances that are made up of only one kind of particle and have a *fixed or constant structure.* ***E.g. Diamond, sulphur, tin, etc.***
    1. ***Element:*** A pure substance made up of only *one type of atom* that *cannot* be broken down into *simpler substance* by chemical means. ***E.g. H (Hydrogen) and O (Oxygen).***
    2. ***Compound:*** A pure substance made up of *two or more different types of elements* that are *chemically bonded* together in a fixed ratio. Elements can be separated into constituents by chemical or electrochemical change.

       E.g. H_2O (Water).
2. ***Impure Substances:*** Impure substances, also known as mixtures, are made up of two or more different substances. ***E.g. Brass (Cu+Zn), Bronze (Cu+Sn).***

Four Fundamental States of Matter

Solids

• They have *distinct boundaries* and *fixed volumes*.

• They have a *definite shape*.

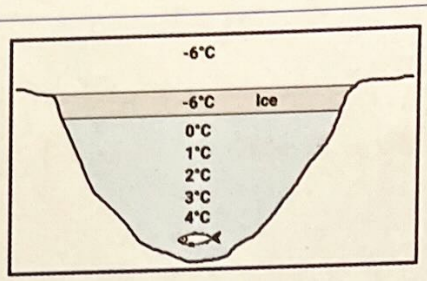
• They have a tendency to maintain the shape when subjected to outside force.

• ***Types of solids:*** *Amorphous solids* and *Crystalline solids*.

Amorphous Solids	Crystalline Solids
Isotropic in nature (same properties in all direction)	Anisotropic in nature (properties vary with direction)
They have irregular shape	They have a definite shape
They are pseudo solids	They are true solids
They have an irregular arrangement of constituent particles	They have a regular arrangement of constituent particles
They do not have sharp melting point	They have sharp melting point
E.g. Glass, rubber, plastic, etc.	*E.g. Copper, Silver, NaCl*

Latent Heat: *The energy absorbed during a state change without a temperature rise is called latent heat.*

- *In melting this heat is used to overcome the forces of attraction between particles, so that temperature stays constant until the solid is fully melted.*



The ***anomalous expansion of water*** has numerous ***applications***, the foremost being that when ***water*** freezes, the ice floats to the top. This allows liquid ***water*** to remain underneath. This allows aquatic ***life*** to survive in freezing environments.

liquid

• A liquid is a state of matter that can flow and take the *shape of its container*.

Crystalline solid changes abruptly from solid to liquid when heated.

Gas

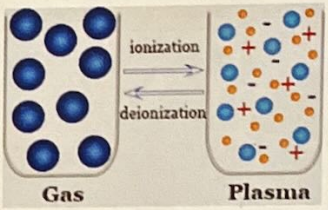
• A gas is a substance that is in a *gaseous, or vaporous*, state of matter. It exhibits behaviour uniformity.

Plasma

• It is the *4th* state of matter.

• A plasma is an *ionised gas*, with roughly equal numbers of positively and negatively charged particles.

• It can be produced in laboratory by *heating a gas* to an *extremely high temperature*.



Transition between Gas and Plasma through Ionization and Deionization

• *Stars* are made of plasma.

States of Matter	*Intramolecular Space*	*Kinetic Energy*	*Movement*	*Force of Attraction*
Solid	Low	Low	Low	High
Liquid	Medium	Medium	Medium	Medium
Gas	High	High	High	Low

Bose-Einstein Condensate (BEC)

• The *fifth* state of matter is *Bose-Einstein condensate (BEC)*.

• It is typically formed when a *gas of bosons* at very *low densities is cooled to temperatures very close to absolute zero*, i.e., ***0 K (–273.15°C; –459.67°F).***

• ***Origin of Name:*** The term *"Boson"* comes from the name of *Dr. Satyendra Nath Bose*, an Indian physicist whose work on quantum mechanics was extended by *Albert Einstein* in *1925*.

• ***Discovery:*** Dr. Bose published a research paper in *1924* and sent it to Einstein, who further developed the concept and predicted the existence of BEC in *1925*.

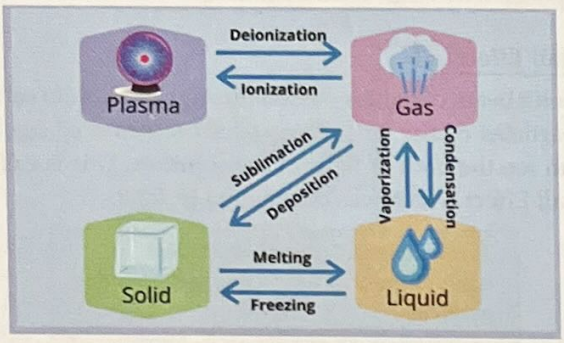
First Production of Bose-Einstein Condensate (BEC)

• *1995: Eric Cornell* and *Carl Wieman* experimentally produced the first *BEC condensate* in a rarefied *gas of rubidium atoms* at extremely low temperature.

• *1995: Wolfgang Ketterle* later created a BEC condensate with *sodium atoms. All three of them received Nobel Prize in Physics in 2001.*

Change in State of Matter

Sublimation: The process of changing a solid directly into a gas without passing through a liquid state. ***E.g. Naphthalene, dry ice, etc.***



Phase Change of Matter

• ***Deposition:*** The opposite of sublimation, where a *gas turns into a solid without passing through a liquid state.* ***E.g. The formation of frost or ice-crystals on the surface.***

• ***Evaporation:*** The process of changing a *liquid into a vapour by heating*. This happens at boiling point of liquid. ***E.g. Evaporation of nail polish remover.***

• ***Condensation:*** The process by which *water vapour in air changes into liquid*. ***E.g. Dew, Fog.***

Favourable Conditions for Evaporation

• When temperature *increases*, the rate *of evaporation increases.*

• When surface area *increases*, the rate of *evaporation increases.*

• When wind speed *increases*, the rate of *evaporation increases.*

• When humidity *increases*, the rate of *evaporation decreases.*

Mixture

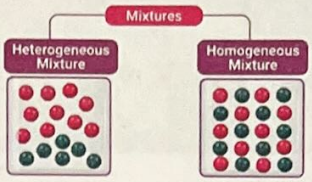
• A mixture is a composition of *two or more pure substances.*

Mixtures are considered to be *homogeneous* or *heterogeneous* in nature.

Homogeneous Mixture vs Heterogeneous Mixture

Homogeneous Mixture	*Heterogeneous Mixture*
They have a uniform composition	They have a non-uniform composition
The components of mixture cannot be separated through physical process	The components can be separated through physical process
The component cannot be seen through naked eyes	The components can easily be seen through naked eyes
They exist in single-phase	They can exist in two or more phases
E.g. A mixture of water and milk	*E.g. A mixture of oil in water*

Solution



• A solution is a homogeneous mixture formed when one or more substances *(solute)* dissolve in another substance *(solvent)*. The composition is uniform throughout, meaning the solute is evenly distributed within the solvent. ***E.g.***

• ***Liquid into liquid: Water and Ink.***

Solute + Solvent = Solution

• ***Solid into Solid: Alloys.***

• ***Gas into Gas: Air.***

• ***Solid into a liquid: Sugar and Water.***

• ***Gas into Solid: Hydrogen dissolved in palladium.***

• ***Gas into Liquid: Carbon Dioxide dissolved in water.***

Properties of Solution

1 nm = 10^{-9} m

1. It is *homogeneous* in nature.
2. The particles of solution are too *small (less than 1 nm).*
3. It *does not* scatter light.
4. It cannot be separated by filtration.
5. It is *stable* in nature.

More Examples of Solution

• A solution of sugar in water is a solid in *liquid solution.* In this solution, sugar is the solute and water is the solvent.

• A solution of iodine in alcohol known as *"Tincture of Iodine"*, this solution has iodine (solid) as the solute and alcohol (liquid) as the solvent. This solution is also used as *Antiseptic.*

• Aerated drinks like soda water, etc., are gas in *liquid solutions.* These contain carbon dioxide (gas) as solute and water (liquid) as solvent.

• Air is a mixture of gas in gas. Air is a *homogeneous mixture* of a number of gases. Its two main constituents are: oxygen (21%) and nitrogen (78%). The other gases are present in very small quantities.

Types of Solution

1. ***Unsaturated Solution:*** It is a solution that contains *less solute than the maximum amount it can dissolve.*
2. ***Saturated Solution:*** It is a solution that contains the *maximum amount of solute that can dissolve* in a given amount of solvent at a specific temperature.
3. ***Concentrated Solution:*** It contains a *large amount of solute relative to the solvent.*

Calculation of Mass % of a Solution

$$\text{Mass \% of solute} = \frac{\text{Mass of Solute}}{\text{Mass of Solution}} \times 100$$

Alloy

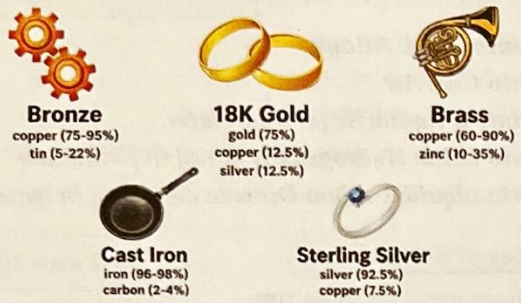
• An alloy is a *mixture of different metals or non metals* that cannot be separated by physical method. ***E.g. Brass, Bronze, Nichrome, etc.***

E.g.

Q. A solution contains 40 g of common salt in 320 g of water. Calculate the concentration in terms of mass by mass % of the solution.

Solution:

$$\frac{40}{40+320} \times 100 = 11.11\% \text{ — Mass \% of the solution}$$



Types and Composition of Alloy

Suspension

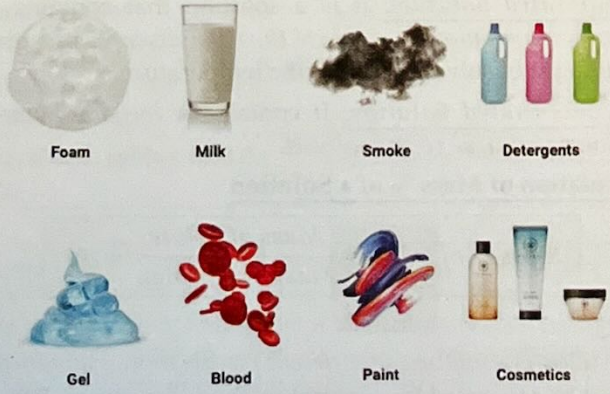
- A suspension is a mixture in which two or more substances are combined in a *non-uniform* manner. In a suspension, the *solute does not dissolve completely in the solvent*, and its particles remain large enough to be seen with naked eye. *E.g. Suspension may include muddy water, flour in water, and chalk powder in water.*

Properties of Suspension

- It is *heterogeneous* in nature.
- It *scatters light* (shows Tyndall Effect) because particle size is large *(greater than 1000 nm)*.
- It can be separated using *filtration method*.
- It is *unstable* because solute gets settled down in solvent.

Colloids

- A colloid is a mixture in which one substance is dispersed evenly throughout another. Although colloids appear uniform (homogeneous) to the naked eye, they are actually *heterogeneous* when viewed under a microscope.
- The particle size of colloid is intermediate *(1-1000 nm)* between that of a *solution* and *suspension*.



Examples of Colloidal Solution

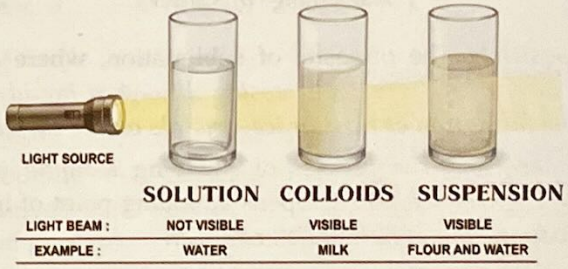
Properties of Colloids

- Colloids are *heterogeneous* in nature.
- The particles *cannot* be seen through naked eyes *(particle size: Between 1 and 1000 nm)*.
- The particles of *colloid do not settle* down if left uninterrupted, hence they are stable.
- It cannot be separated through filtration method but can be separated through centrifugation.

Tyndall Effect

- When a beam of light is passed through a colloidal solution, the particles of the *colloid scatters the beam of light* and we can see the path of light in the solution. This is called as Tyndall Effect which was discovered in *1869*.

Turbidity measures the haziness or cloudiness of water due to suspended particles.



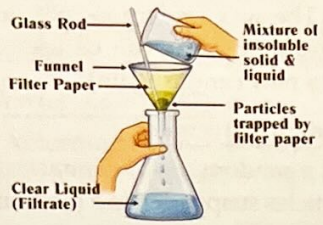
Tyndall Effect in Solution, Colloid, and Suspension

Types of Colloids

Dispersed Phase	*Dispersing Medium*	*Type*	*Example*
Liquid	Gas	Aerosol	Fog, clouds, mist
Solid	Gas	Aerosol	Smoke, automobile exhaust
Gas	Liquid	Foam	Shaving cream
Liquid	Liquid	Emulsion	Milk, face cream
Solid	Liquid	Sol	Milk of magnesia, mud
Gas	Solid	Foam	Foam, rubber, sponge
Liquid	Solid	Gel	Jelly, cheese, butter
Solid	Solid	Solid Sol	Coloured gemstone, milky glass

Different Methods to Separate Components of a Mixture

- We can separate the *heterogeneous mixtures* into their constituents by means of physical methods such as → *Filtration*, *Hand-picking*, *Sieving*.
- *Filtration:* It is a physical separation process that separates *solid matter* and *fluid from a mixture* using a filter medium.
- *Hand-picking:* It is a method of separating substances in a *mixture* by *hand* when the components are clearly visible enough to pick.
- *Sieving:* It is a method of using a *sieve* to distinguish small particles from bigger particles.



(A)

(B)

(C)

(A) Filtration Method; (B) Hand Picking; (C) Sieving

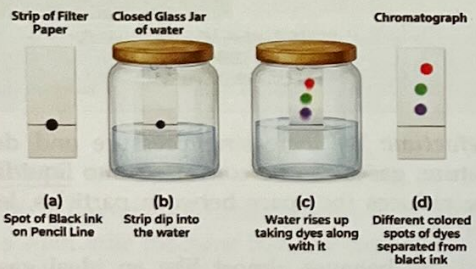
Other Methods of Separation of components of Mixture

1. ***Evaporation:*** It is a process that is used to separate a mixture of a ***non-volatile*** and a ***volatile*** substance.

Applications

- It is used to separate coloured dye from the ink.
- It is used to separate salt from water.
- It is used to separate sugar from water.

2. ***Chromatography:*** It is a technique used to separate ***different components*** of mixture that are soluble in ***same solvent***.

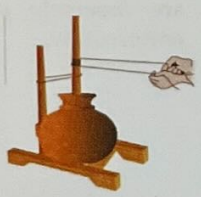


Applications

- It is used for separating different colors of a dye.
- It is used to separate drugs from blood.

3. ***Centrifugation:*** It is a process that is used to separate ***dense particles*** from ***lighter particles***.

Applications



- It is used to separate cream from milk.
- It is used to separate butter from cream.
- It is used to squeeze out water from wet clothes.

4. ***Separating Funnel:*** It is a process that is used to separate ***two immiscible liquids***.

Application

- It is used to separate oil from water.

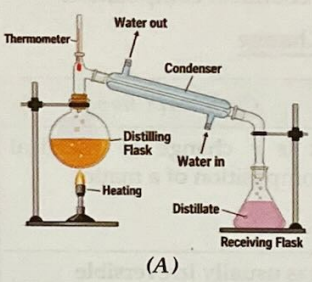
5. ***Distillation:*** It is used to separate two ***miscible liquids*** (the ***boiling point*** of the liquids must be ***sufficiently different***).

Application

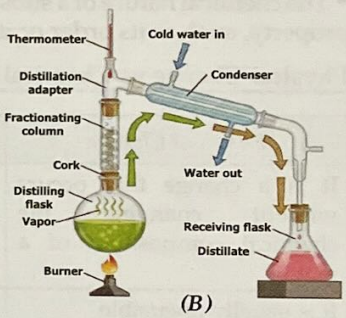
- It is used to separate acetone and water.

Types of Distillation

1. ***Simple Distillation:*** It is used to separate miscible liquids with boiling point differences of ***more than 25 Kelvin*** (or 25°C).
2. ***Fractional Distillation:*** It is used to separate miscible liquids with boiling point differences of ***less than 25 Kelvin*** (or 25°C). It is also used to separate ***components of air***, like nitrogen and oxygen, based on their boiling points.



(A)



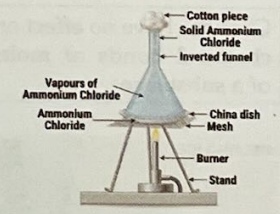
(B)

(A) Simple Distillation; *(B) Fractional Distillation*

6. ***Sublimation:*** It is a process that is used to separate a ***sublimable component*** from ***non-sublimable component***.

Application

- It is used to separate ammonium chloride / camphor / naphthalene and salt.



Purifying Solids

Crystallization

- It is a process of formation of ***solid crystals from solution***, melt, or by deposition directly from ***gas phase***.
- It is the most commonly used method for the process of ***purification of solids.***
- In this method, impure substances are dissolved in a minimum amount of water and then filtered.

> ***Fractional Crystallization:***
> ***It is the method of separating a mixture of soluble solids by dissolving them in a suitable hot solvent and then lowering the temperature slowly.***

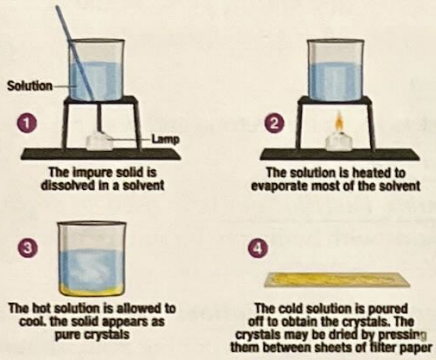
Application

- It is used to separate salt from seawater.
- It is used for purification of copper sulphate.

PHYSICAL AND CHEMICAL CHANGES

Physical Properties of a Substance

• The physical property of a substance is which we can observe, such as rigidity, colour, fluidity, boiling point, melting point, density, and hardness.



Crystallization Process

Chemical Properties of a Substance

• The chemical nature of a substance is known as its chemical property, such as its order or its chemical composition.

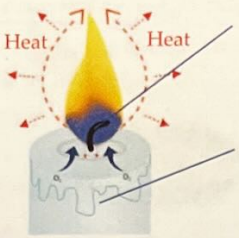
Physical Change vs Chemical Change

Physical Change	*Chemical Change*
It is a change that occurs without changing the chemical composition of a matter	It is a change of chemical composition of a matter
It is usually reversible	It is usually irreversible
New products are not formed	New products are formed
Some changes occur when heating or cooling it down	Changes always involve absorption or release of energy
Changes have no effect on the chemical bonds of molecule of a substance	They have a direct effect on chemical bonds of molecules in a substance

Few Examples of Physical and Chemical Changes

• *Burning of candle* is both *physical* and *chemical* change.

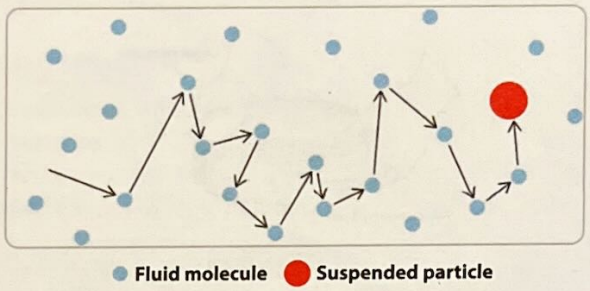
Thread (The thread undergoes chemical change, as it cannot be obtained again once burnt)



Wax (The wax undergoes physical change, as the wax can be used to make a new candle again)

Brownian Movement

• It is a random *zig-zag movement* of particles suspended in a medium.

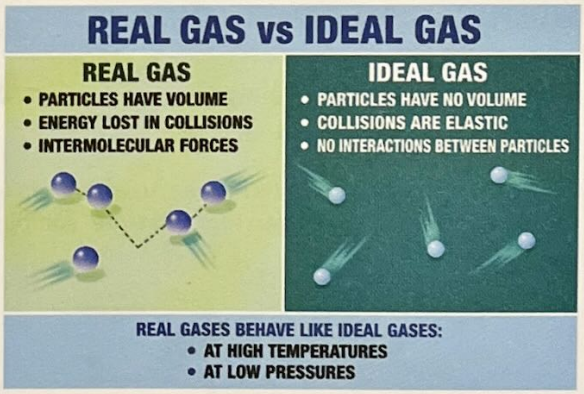


Brownian Movement of Particles

• This motion is a result of the *collisions of the particles* with other fast-moving particles in the fluid.

• It was named after *Robert Brown* after he discovered the phenomenon in *1827*.

Types of Gases



• *Liquefaction:* By increasing pressure and decreasing temperature, gases can be converted into liquids. Higher pressure reduces the space between particles, leading to liquefaction.

• A real gas behaves almost like an ideal gas at *high temperatures* and *low pressures*, where intermolecular forces and the volume occupied by the gas molecules become *negligible*.

Gas Laws

Boyle's Law (1662)

• According to Boyle's Law, *pressure* and *volume* are *inversely proportional* to each other at *constant temperature*.

$$P \propto \frac{1}{V}$$

$$P_1V_1 = P_2V_2$$

At constant T, as pressure increases, volume decreases

Charles' Law (1787)

• According to Charles' Law, ***temperature*** and ***volume*** are ***directly proportional*** to each other at ***constant pressure***.

$$V \propto T$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

*At constant P, as temperature increases, volume increases.

Gay-Lussac's Law (1808)

• According to Gay-Lussac's Law, ***pressure*** and ***temperature*** are ***directly proportional*** to each other at ***constant volume***.

$$P \propto T$$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

*At constant V, as pressure increases, temperature increases.

Avogadro's Law (1811)

• Avogadro's law states that an ***equal volumes of all gases*** under the same ***temperature*** and ***pressure*** conditions contain an equal number of molecules. In other words, the ***volume of a gas*** is ***directly proportional*** to the ***number of moles of gas***, when ***temperature*** and ***pressure are constant***.

$$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$

Solubility of gases in liquids increases with decrease in temperature.

Extra pointers

• We prefer to have a liquid and not a gas to be used as the fluid in a hydraulic machine because liquids are nearly incompressible and transfer the pressure applied to them.

• Pure demineralized water, free from all soluble mineral salts, is obtained by passing water through a cation exchange resin bed.

ATOM AND ITS STRUCTURE

Atoms

• Atoms are the smallest component of an element and are building blocks of matter. An atom is composed of *protons (p)*, *neutrons (n)* and *electrons (e-)*.

> • *Father of modern chemistry: Antonie Lavoisier.*
> • *Father of nuclear physics: Ernest Rutherford*

LAWS OF CHEMICAL COMBINATION

Law of Conservation of Mass

• The law of Conservation of Mass states that in a closed system, the *total mass of a system remains constant* over time, meaning mass is neither created nor destroyed, but can only change form.

• This was given by *Antoine Lavoisier*.

Law of Constant Proportion

• The law states that a given chemical compound always contains its component elements in a *fixed ratio by mass*, regardless of its source or method of preparation.

• This was given by *Joseph Proust*.

Law of Multiple Proportion

• When two elements form more than one compound, the different masses of one element that combine with a fixed mass of the other are in a ratio of small whole numbers.

• It was given by *John Dalton*.

Dalton's Atomic Theory_(1808).

According to Dalton's Theory:

• All matter is made of indivisible particles called *atoms*, which cannot be created nor destroyed.

• Atoms of the *same element* have *identical mass* and *physical properties*.

• Compounds are *combinations of atoms* of two or more elements.

• All chemical reactions involve the rearrangement of atoms.

THE ATOMIC MODELS

J.J. Thomson and Discovery of Electron (1897)

1897: J. J. Thomson performed *Cathode-Ray Experiment* by observing streams of particles emitted by cathode of a vacuum tube, which led to the discovery of the *electron*.

He Proposed:

(i) An atom consists of a *positively charged sphere* and the *electrons are embedded* in it.

(ii) The negative and positive charges are *equal in magnitude*. So, the atom as a whole is electrically neutral.

• *1904:* J. J. Thomson proposed the first atomic model, often referred to as the *"Plum Pudding Model"*, *"Raisin Pudding Model"*, or *"Watermelon Model"*. In this model, the *positive charge* is spread throughout the atom (like the bulk of pudding or watermelon), while the *electrons* are embedded within it (like plums or seeds).

Thomson's Plum Pudding Model

Ernest Rutherford's Atomic Model (1911)

• In *1909*, Ernest Rutherford conducted the *Gold Foil Experiment* with the help of *Hans Geiger* and *Ernest Marsden*.

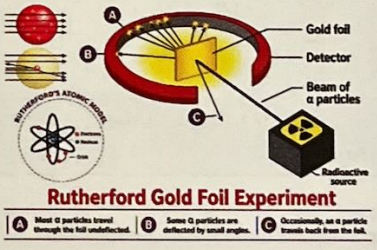
Gold Foil Experiment Findings

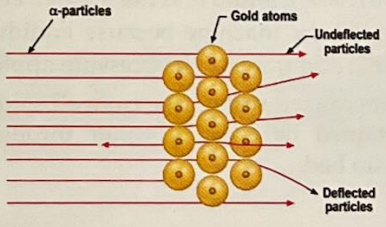
• A few *α-particle* were deflected at small and large angles, indicating the presence of a dense, positively charged nucleus.

• Rutherford used *gold foil* (about *1000* atoms thick) because gold is highly *malleable*, allowing it to be hammered into *ultra thin sheets*. A thicker foil would have prevented the *α-particle* from penetrating. The majority of alpha particles went through the gold foil without any deflection however a smaller number of alpha particles were slightly deflected from their original path. A very few *(1 in 8000)* were deflected backwards, at angles greater than 90°.

Key, Observations and Conclusions:

From the α-particles scattering experiment, Rutherford proposed the following atomic model:





Rutherford's Gold Foil Experiment

(i) An atom has a *positively charged* centre, called the *nucleus*, where nearly all the atom's mass is concentrated.

(ii) *Electrons* revolve around the nucleus in *circular paths* (orbit).

(iii) The nucleus is *extremely small* compared to the overall size of the atom.

(iv) This experiment allowed him to estimate the relative

sizes of the different parts of the atom.

- Atomic radius ~ 1 Å
- Nuclear radius 10^{-15} -10^{-14} m.
- The radius of the atom is about 10^5 times the radius of the nucleus.

Drawbacks of Rutherford's Model

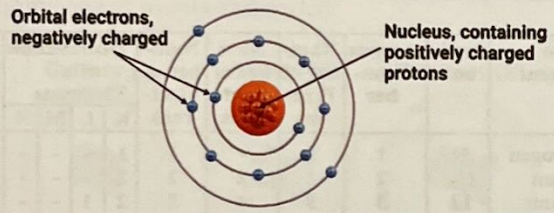
- The atomic model failed to explain the distribution of electrons around the nucleus and the *stability of atoms*.
- It did not explain why *atoms emit specific colour* when they are heated.
- It failed to explain why different *elements react differently* or how *electrons are arranged*.
- The atomic model *did not include energy levels* which was later explained through *Bohr's Model (1913)*.

Artificial Nuclear Reaction (1917)

- In *1917*, Rutherford performed the *first artificially induced nuclear reaction* by conducting an experiment in which nitrogen nuclei was bombarded with α-particles.

Key Observations:

- Rutherford concluded that the *hydrogen* nucleus is a fundamental particle present in all atoms.
- He named this positively charged particle the *proton (p)* in *1920*.



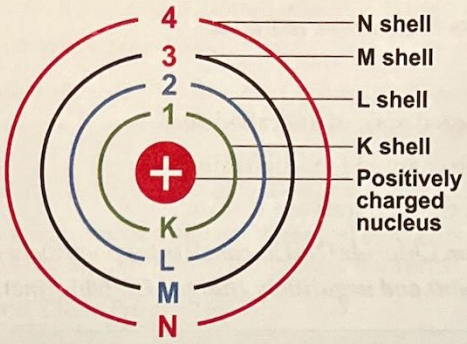
Bohr's Model of Atom (1913)

According to this model:

- Electrons revolve around the nucleus in *stable orbits* (energy levels or shells) without losing energy in the form of radiation.
- The orbits or energy levels are labeled *K, L, M, N,* with *K* being the *closest* to the nucleus and *N* being the *farthest*.
- The *ground state is the lowest energy level* that an electron can occupy, typically referring to the electron's position in the K-shell (the innermost shell).
- When an electron moves between different energy levels (or shells), it either *absorbs or emits energy*.
- When an electron falls from a higher energy level to a lower one, it emits energy, usually in the form of electromagnetic radiation.
- When an electron moves from a lower energy level to a higher one, it absorbs energy.

Bohr's model was groundbreaking but has a major limitation: it only works for one electron system, also called hydrogen-like species.

- ***Discrete Orbits:*** Only certain special orbits known discrete orbits of electrons are allowed inside the atom.
- ***Energy Radiation:*** While revolving in these discrete orbits, the electrons do not radiate energy.
- ***Wave-particle duality:*** It was central to developing the Bohr model and, later the, full quantum mechanical model of the atom.



Bohr's Atomic Model

Distribution of Electrons (e-)

- The maximum number of e- that can be present in the nth shell is equal to $2n^2$. Thus, we have
- *Last shell/orbit → Valence shell → e → Valence e-*

Shell	*Maximum no. of e-*
1st shell or K-shell (n = 1)	$2 \times 1^2 = 2$
2nd shell or L-shell (n = 2)	$2 \times 2^2 = 8$
3rd shell or M-shell (n = 3)	$2 \times 3^2 = 18$
4th shell or N-shell (n = 4)	$2 \times 4^2 = 32$

ELECTRON, PROTON, AND NEUTRON

Discovery of Electron, Proton and Neutron

- *Electron discovered by: J. J. Thomson.*
- *Proton discovered by: Rutherford or Goldstein.*
- *Neutron discovered by: Chadwick (1932).*
- *Nobel prize won by:*

- J.J. Thomson-1906
- Ernest Rutherford- 1908
- Niels Bohr - 1922

Comparison of Characteristics of Electron, Proton and Neutron

Particle	*Charge on the particle*	*Mass of the particle*	*Symbol*	*Location in the atom*
1. *Electron*	-1 *unit* (-1.602×10^{-19} *coulomb*)	9.11×10^{-31} *kg* ($\frac{1}{1840}$ *u*)	${}^{0}_{-1}e$	*Outside the nucleus (Extranuclear part)*
2. *Proton*	$+1$ *unit* ($+1.602 \times 10^{-19}$ *coulomb*)	1.673×10^{-27} *kg* (1 *u*)	${}_{+1}P^{1}$	*In the nucleus*
3. *Neutron*	*No charge*	1.675×10^{-27} *kg* (1 *u*)	${}^{1}_{0}n$	*In the nucleus*

Characteristics of Electron, Proton, and Neutron
***A neutron's mass is approx. 1836 times greater than that of electron.*

Neutrons

- Neutrons are sub-atomic particles that are found in the nucleus of every atom, except for hydrogen, which only has a proton in its nucleus.
- Protons and neutrons are collectively known as *nucleons*.
- The mass of neutrons is *1 amu*.

Ions

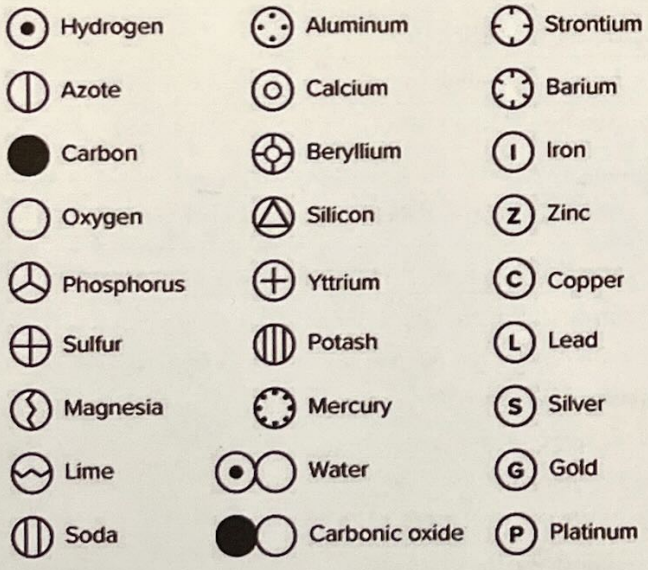
- The charged species are called *Ions*.
- Negative charged ions are *Anion*.
- Positive charged ions are *Cation*.

E.g. Sodium Chloride (NaCl) constitutes positively charged Na^+ (sodium) and negatively charged Cl^- (chlorine).

Positron: Discovered in 1932 by Carl Anderson.

Symbols of Elements

- The symbols of elements were first given by *Jacob Berzelius (1813)* and were used by *Dalton* for the first time.
- He proposed that chemical symbols should be based on the *Latin* names of the elements.

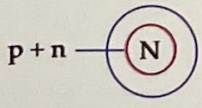


Symbols of Elements

Atomic Number (Z)

Z = no. of protons (p) = no. of electrons (e-)

- Atomic number is always a *whole number*, because it represents the *total number of protons* in an atom.
- The atomic number of an element does not change during a chemical reaction, as chemical reactions involve only *rearrangement of electrons*, not changes in the nucleus.



Mass Number (A)

- *Mass number of an element (A)= No. of protons (p) + No. of neutrons (n)* (present in the atom of an element).
- Since protons and neutrons are present in the nucleus, these particles are collectively called *nucleons*. Thus,

Mass number of an element= Number of nucleons in the atom of that element.

Mass no. (No. of p + n) — a
Atomic no. (No. of protons) — Z **M**

$$A = p + n$$
$$A = Z + n$$
$$A - Z = n$$

E.g. Magnesium (Mg)

Protons (p^+) = 12

Electrons (e-) = 12

Neutrons (n_0) = Mass no. – No. of protons

= 12 (Mass no.= 24)

Electronic Configuration of First 20 Elements

Name Element	Symbol	Atomic Number	Number of Protons	Number of Neutrons	Number of Electrons	Distribution of Electrons				Valency
						K	L	M	N	
Hydrogen	H	1	1	-	1	1	-	-	-	1
Helium	He	2	2	2	2	2	-	-	-	0
Lithium	Li	3	3	4	3	2	1	-	-	1
Beryllium	Be	4	4	5	4	2	2	-	-	2
Boron	B	5	5	6	5	2	3	-	-	3
Carbon	C	6	6	6	6	2	4	-	-	4
Nitrogen	N	7	7	7	7	2	5	-	-	3
Oxygen	O	8	8	8	8	2	6	-	-	2
Fluorine	F	9	9	10	9	2	7	-	-	1
Neon	Ne	10	10	10	10	2	8	-	-	0
Sodium	Ná	11	11	12	11	2	8	1	-	1
Magnesium	Mg	12	12	12	12	2	8	2	-	2
Aluminium	Al	13	13	14	13	2	8	3	-	3
Silicon	Si	14	14	14	14	2	8	4	-	4
Phosphorus	P	15	15	16	15	2	8	5	-	3, 5
Sulphur	S	16	16	16	16	2	8	6	-	2
Chlorine	Cl	17	17	18	17	2	8	7	-	1
Argon	Ar	18	18	22	18	2	8	8	-	0

Electronic Configuration of First 20 Elements

Q. An ion M^{3+} contains 10 electrons and 14 neutrons. What is the mass number and atomic number of element M?

Solution:

M^{3+} = 3 e- lost → *So originally it had 13 e-*

$A = p + n$ → *13 e- = 13 p^+ = atomic no. = 13*

$= 13 + 14$ → *Mass no. (A)= No. of protons (p)*

$A = 27$ *+ No. of neutrons (n)*

ISOTOPES

• Isotopes are atoms of same elements that have *same atomic number, but different mass number.*

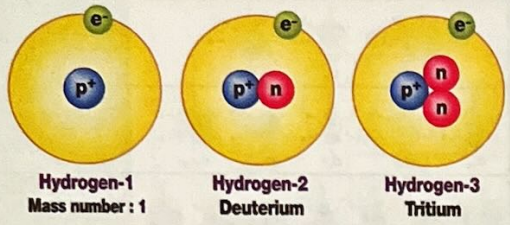
• Isotope of an element differ only in *number of neutrons* present in the nucleus.

Isotopes of Hydrogen

$^{1}_{1}H$(e- = p = 1, n = 0): *Protium*

$^{2}_{1}H$(e- = p = 1, n = 1): *Deuterium*

$^{3}_{1}H$(e- = p = 1, n = 2): *Tritium* (radioactive in nature).

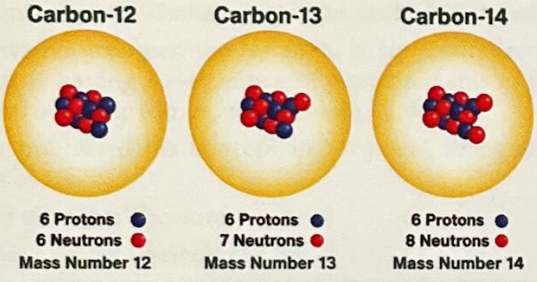


Isotopes of Carbon

$^{6}C_{12}$ (e- = p = 6, n = 6): *Carbon-12*.

$^{6}C_{13}$ (e- = p = 6, n = 7): *Carbon-13*.

$^{6}C_{14}$ (e- = p = 6, n = 8): *Carbon-14* (used in Carbon Dating to determine age of fossils and rocks).



Characteristics of Isotopes

1. *Same Chemical Properties*

• Isotopes have same electronic configuration, hence *same number of valence e-*. Since chemical property depends upon the number of valence e-. Therefore, they have same chemical properties.

2. *Different Physical Properties*

• Since, the isotopes of an element have *different masses*, hence different physical properties, like melting point, boiling point, density, etc. exist.

Q. Atomic Mass of Chlorine is 35.5. How?

Solution:

$^{35}_{17}Cl$: $^{37}_{17}Cl$

3 : 1

$$\text{Atomic Mass} = \frac{35 \times 3 + 37 + 1}{3 + 1}$$

$$= 35.5$$

→ *Chlorine has two isotopes Cl-35 and Cl-37 which exists in ratio 3 : 1.*

Uses of Isotopes

1. In *nuclear reactors*, isotopes like *Uranium-235* are used as fuel to sustain a controlled nuclear chain reaction, generating heat that powers electricity production.
2. In *radiation therapy*, isotope *Cobalt-60* is used to destroy and prevent *cancer cells*.
3. In treatment of *goitre*, isotope *Iodine-131* is used.

ISOBARS

• Isobars are atoms of different chemical elements that have *same mass number, but different atomic numbers*.

Isobars and Their Properties

• They are atoms of different elements.

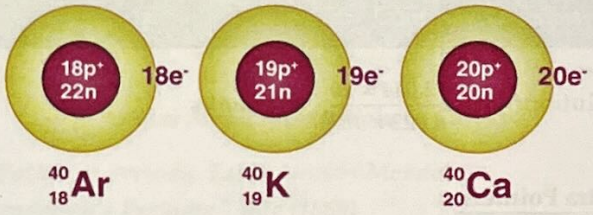
• They have different atomic number.

• They have same mass number.

• They have similar physical properties and different chemical properties.

• They have different number of protons, electrons, neutrons.

E.g. Argon (Ar), Potassium (K), Calcium (Ca).



ISOTONES

• Isotones are atoms that have the *same neutron number but different proton number*.

Element	*Protons*	*Electrons*	*Neutrons*
$^{16}_{8}O$	8	8	8
$^{15}_{7}N$	7	7	8

MOLE CONCEPT

Mole

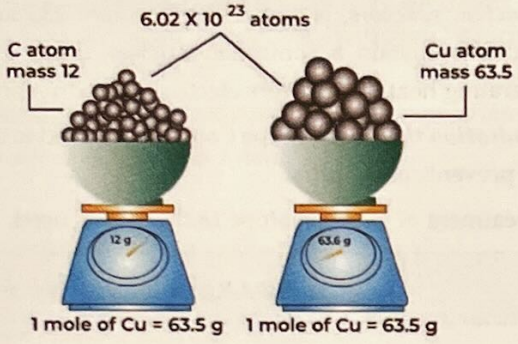
• It is a unit of measurement that represents the amount of a substance.

• It is a *base unit* in the *International System of Units* (SI).

• *One mole* of a substance contains 6.022×10^{23} elementary entities *(Avogadro's Number)*, such as atoms, molecules, or ions.

$$\text{No. of Moles} = \frac{\text{Given Mass } (m)}{\text{Molecular Mass } (M)} = \frac{\text{Given no. of Particles } (N)}{\text{Avogadro No. } (N_0)} \rightarrow N = \frac{m}{M} = \frac{N}{N_0}$$

E.g. Copper



Q. What will be the number of moles in 2g of Helium (He)?

Solution: $n = \frac{2}{4} = \frac{1}{2} = 0.5$ *moles* → *The molecular mass of helium* = 2 + 2 = 4

2 → *protons*

2 → *neutrons*

Q. What will be the number of moles in 12.044×10^{24} *particles of N atoms?*

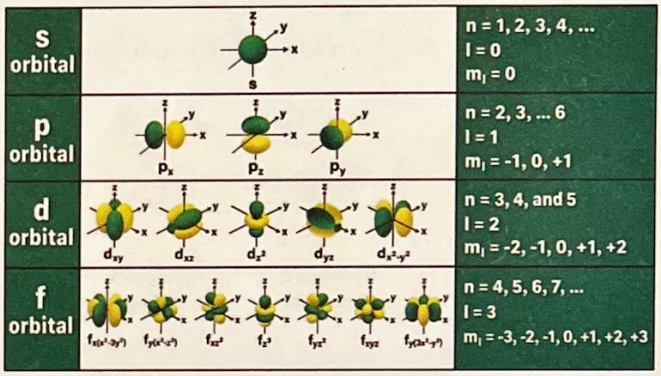
Solution: $n = \frac{12.044 \times 10^{24}}{6.022 \times 10^{23}} = 20$ *moles*

Extra Pointers:

- The size of an atom is determined by its electrons and electron clouds, which occupy over 99.99% of its total volume. While the nucleus holds the mass, the physical boundary and radius of an atom is defined by the arrangements and number of its electron shells.
- The size of atoms is in the range of nanometers.
- Carbon-12 was chosen as the standard for the atomic mass unit because it gives atomic masses close to whole numbers.
- ***Beta- minus decay:*** Atomic number increases by 1, mass number remains the same.
- ***Beta-plus decay:*** Atomic number decreases by 1, mass number remains the same.
- ***Alpha decay:*** reducing atomic number by 2 and mass by 4
- ***Gamma decay:*** only energy is lost.
- ***Muon:*** Fat electron, 200 times heavier than electron.

Atomic Orbitals and Quantum Numbers

Number	Symbol	Possible Values
Principal Quantum Number	n	$1, 2, 3, 4, \ldots$
Angular Momentum Quantum Number	ℓ	$0, 1, 2, 3, \ldots, (n-1)$
Magnetic Quantum Number	m_l	$-\ell, \ldots, -1, 0, 1, \ldots, \ell$
Spin Quantum Number	m_s	$+1/2, -1/2$



EARLY ATTEMPTS AT CLASSIFICATION OF ELEMENTS

Döbereiner's Law of Triads (1817)

• Döbereiner observed that when groups of three elements with similar properties (which he named *"triads"*) were arranged by increasing atomic mass, *the atomic mass of the middle element* was approximately the average of the atomic masses of the *1st and 3rd elements*.

Dobereiner's Triads

Elements	Atomic Mass	Average
Lithium (Li) Sodium (Na) Potassium (K)	6.9 23.0 39.0	$\frac{6.9 + 39.0}{2} = 22.95$
Calcium (Ca) Strontium (Sr) Barium (Ba)	40.1 87.6 137.3	$\frac{40.1 + 137.3}{2} = 88.65$
Chlorine (Cl) Bromine (Br) Iodine (I)	35.5 79.9 126.9	$\frac{35.5 + 126.9}{2} = 81.2$

Newland's Law of Octaves (1865)

• Newland discovered that when elements are arranged in increasing order of their atomic mass, the 1st and the 8th elements showed similar properties and characteristics.

• Newland arranged the elements in horizontal rows, with each row having 7 elements and compared this to the eight octaves of music (do, re, mi, fa, so, la, ti, do).

• He published his concept in *1864* and recognition was given in *1865*.

• Last element: Thorium.

• Total number of elements: 56.

Sa (do)	re (re)	ga (mi)	ma (fa)	pa (so)	da (la)	ni (ti)
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	-	-

Elements Arranged on the Basis of Musical Note

Limitations of Newland's Model

1. The law was not true for elements beyond *Calcium*. After calcium, every eighth element *did not share similar properties to the first one*.

2. Those elements that were discovered after Newlands' octaves did not follow the law of octave.

3. To fit elements into his table, Newland sometimes placed two elements in the same position, even when they had different chemical and physical properties. ***E.g. Cobalt and Nickel were placed in the same slot without considering their differences from Iron, which was placed far away, despite similarities.***

4. The periodic table did not include noble gases because they were not discovered then.

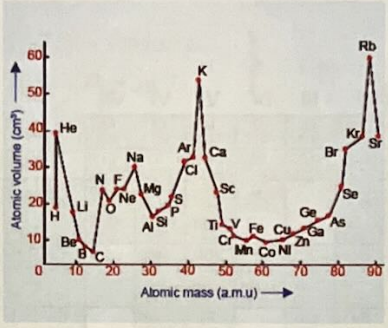
Lothar Meyer

• Meyer published his first periodic table in *1862*, which included *28* elements.

• He published an updated version in *1864*, which included *50* elements.

• He was the *first* to identify *periodic trends* in the properties of elements.

• He plotted the *atomic volume of an element against its atomic weight* to show this pattern.



Lothar Meyer Atomic Volume Curves

• ***Father of Periodic Table:*** *Dmitri Mendeleev*.

Mendeleev's Periodic Table (1869)

• The periodic table was created in *1869* by *Dmitri Mendeleev*, a Russian chemist and inventor.

• He arranged the *63* known elements at the time in order of their increasing relative atomic masses.

• He divided the table into *8 groups* and *7 periods*.

Mendeleev's Periodic Law

• Mendeleev's law states that the physical and chemical properties of elements are periodic functions of their atomic masses, meaning that when elements are arranged in order of increasing atomic mass, *elements with similar properties repeat themselves at regular intervals*.

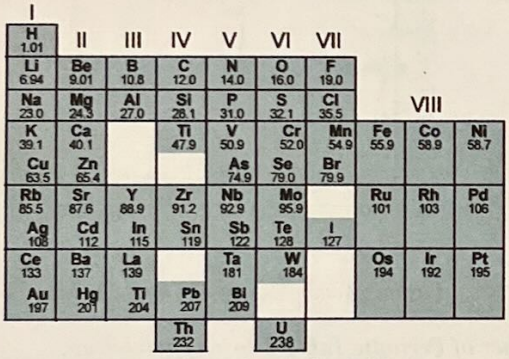
Mendeleev's Given Name	*Modern Name*
Eka-aluminium	Gallium
Eka-boron	Scandium
Eka-silicon	Germanium
Eka-manganese	Technetium
Tri-manganese	Rhenium
Dvi-tellurium	Polonium
Dvi-caesium	Francium
Eka-tantalum	Protactinium

Element	Atomic Mass
Eka Boron	44 (Scandium) → 44.955912 u
Eka Silicon	72 (Germanium) → 72.64 u
Eka Aluminium	68 (Gallium) → 69.723 u

• *Marie Curie won Nobel prize in 1903 for radioactivity research and 1911 for discovering radium and polonium*

Limitations of Mendeleev's Periodic Table

1. The position of *hydrogen is not fixed.*
2. The *increasing order of atomic weight* is not maintained.
3. Some elements in the same group differ in their properties.
4. Lanthanides and Actinides were not included in the table.



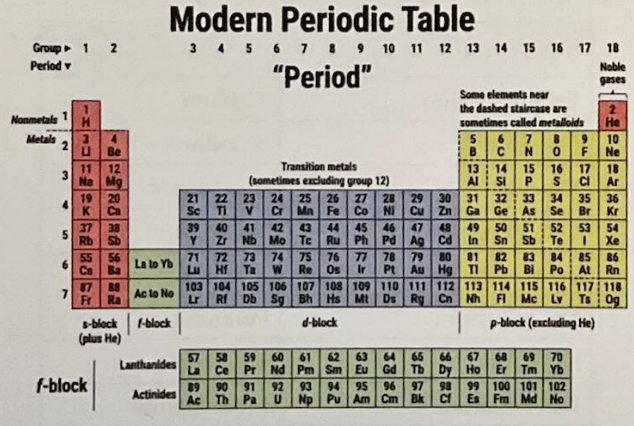
Mendeleev's Periodic Table

MODERN PERIODIC TABLE

• It was given by *Henry Moseley* in *1913.*

• Moseley discovered that elements are best characterized by their atomic number (the number of protons in the nucleus) and not by atomic weight.

• *The modern periodic table contains: 18 Groups* and *7 Period.*



Groups (vertical lines) → 18
Periods (horizontal lines) → 7
Elements → 118
Naturally occurring elements → 94

• *s: Valence e- s subshell → Group 1 & 2.*

• *p: Valence e- p subshell → Group 13 to 18.*

• *d: Valence e- d subshell → Group 3 to 12 (Transition Metals).*

• *f: Valence e- f subshell → Inner Transition Metals.*

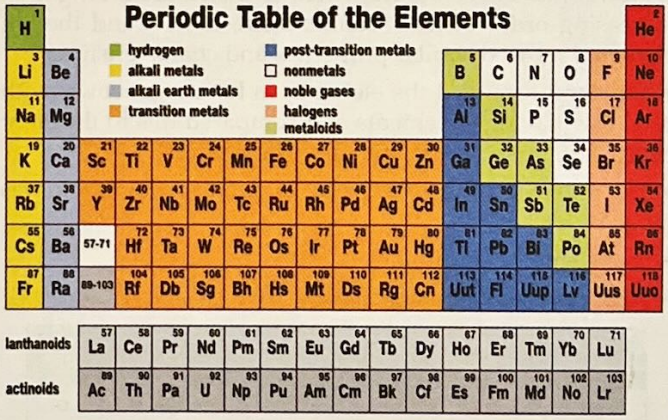
• *s* and *p-block* elements are collectively called as *Representative Elements.*

• *Metals: s, p, d, f.*

• *Non-metals: Only in p-block.*

• *Metalloids (7"): Only in p-block (Germanium, Arsenic, Antimony, Tellurium, Boron, Polonium, and Silicon).*

Metalloids are chemical elements that have both properties of metal and non-metals.



Hydrogen → Group 1A
1st Group → Alkali metal
2nd Group → Alkaline Earth metals
Group 15 → Pnictogens
Group 16 → Chalcogens
Group 17 → Halogens
Group 18 → Noble gas/Inert gas

Noble Gas/Inert Gas/Group 18	Discovered By
Helium (used in balloons)	Pierre Janssen and Norman Lockyer
Neon (used in light bulbs)	William Ramsay and Morris Travers

Argon (used in double pane window glasses)	William Ramsay and Lord Rayleigh
Krypton (used in nuclear fission)	William Ramsay and Morris Travers
Xenon	William Ramsay and Morris Travers
Radon	Friedrich Ernst Dorn

Some Special Elements

- *Mendelevium → Z = 101.*
- *Rutherfordium → Z = 104.*
- *Dubnium → Z = 105.*
- *Seaborgium → Z = 106.*
- *Bohrium → Z = 107.*

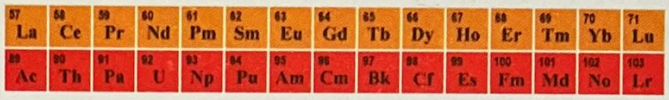
- *There are a total of 94 naturally occurring elements.*
- *1st man-made element: Technetium (Z = 43).*
- *Heaviest naturally occurring elements: Uranium (Z = 92)*
- *Highest density: Osmium(Z=76).*
- *Neptunium is a naturally occurring element found in pitchblende.*
- *The radius of the 1st stationary state orbital of H_2 is 52.9 pm*

TRICK TO REMEMBER GROUPS

Groups	Elements With TRICK
Group 1	Helium Lithium Sodium Potassium Rubidium Caesium Francium *H Li Na K Rb Cs Fr* Helina Kabra Se Farar
Group 2	Beryllium Magnesium Calcium Strontium Barium Radium *Be Mg Ca Sr Ba Ra* Beta Mange Car Sundarkanya Baap Raaji
Group 13	Boron Aluminium Gallium Indium Thallium *B Al Ga In Tl* Baingan Aalo Gajar In Thaili
Group 14	Carbon Silicon Germanium Tin Lead *C Si Ge Sn Pb* Kahe Sita Ji Sune Parbati
Group 15	Nitrogen Phosphorus Arsenic Antimony Bismuth *N P As Sb Bi* Nepal Pakistan Australia Sab Bhikari
Group 16	Oxygen Sulphur Selenium Tellurium Polonium *O S Se Te Po* Old Style Se Topi
Group 17	Fluorine Chlorine Bromine Iodine Astatine *F Cl Br I At* Fir Kal Bahar Aayi Aarti
Group 18	Helium Neon Argon Krypton Xenon Radon *He Ne Ar Kr Xe Rd* Hema Neha Aur Karina Jeeti Rehna

Lanthanides and Actinides

- They are collectively called as *Inner Transition Metals* (f-block).



- *Lanthanides: 57-71 → Period 6*
- *Actinides: 89-103 → Period 7*

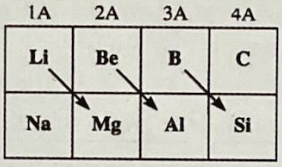
} *Group 3*

Diagonal Relationship

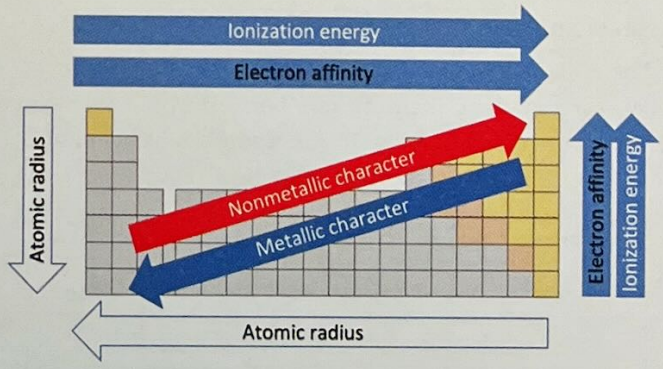
- This relationship is prominent among the lighter members of the *2nd* and *3rd* periods.
- A diagonal relationship in the periodic table is when two elements that are diagonally adjacent in the 2nd and 3rd periods have *similar properties*.

Some examples of diagonal relationships include:

→ *Boron and silicon (they are both semiconductors).*
→ *Li and Mg.*
→ *Be and Al.*
→ *C and P.*



TRENDS IN PERIODIC TABLE



Trends in Modern Periodic Table

Ionisation Energy

→ Ionization energy is the energy required to remove an electron from a neutral atom in its gaseous state.

• ***Across a period (left to right):*** It ***increases*** across a period because it becomes harder to remove an electron from an atom with a higher nuclear charge and smaller atomic radius.

• ***Down the group (top to bottom):*** It ***decreases*** down a group as the outermost electrons are farther from the nucleus and more easily removed.

> • *Elements with highest electron affinity: Chlorine.*
> • *Elements with highest electronegativity: Fluorine.*

Electron Affinity

→ The energy released when an electron is added to a neutral atom to form a negative ion is called electron affinity.

• ***Across a period (left to right):*** It generally ***increases*** (becomes more negative) because of increasing nuclear charge and decreasing atomic size, making it easier for the atom to attract an extra electron.

• ***Down the group (top to bottom):*** It ***decreases*** (becomes less negative) down a group due to increasing atomic size and shielding effect.

Shielding effect

• Reduction in attraction between the nucleus and valence electrons due to the repulsive force of inner-shell electrons.

Electronegativity

→ Electronegativity is the tendency of an atom of a given chemical element to attract shared electrons (or electron density) when forming a chemical bond.

• ***Across a period (left to right):*** It generally ***increases*** as atoms become more effective at attracting electrons due to increasing nuclear charge.

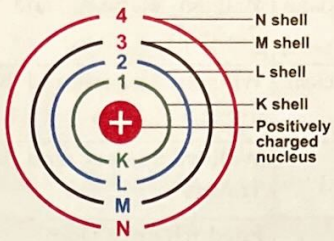
• ***Down the group (top to bottom):*** It generally ***decreases*** as the outermost electrons are further from the nucleus and less strongly attracted.

Electronic Configuration

• The electronic configuration is distribution of electrons of an atom or molecule in atomic or molecular orbitals.

• The *K, L, M,* and *N* shells represent the ***first four energy levels*** (or principal quantum numbers, n = 1, 2, 3, 4) where electrons are distributed, with ***K holding a maximum of 2, L holding 8, M holding 18, and N holding 32 electrons.***

Elements	*K*	*L*	*M*	*N*
$_{3}Li$	2	1		
$_{11}Na$	2	8	1	
$_{8}O$	2	6		
$_{8}O$	2	6		
$_{10}Ne$	2	8		
$_{37}Rb$	2	8	18	8, 1



Rb = 2n
K: 2
L: 8
M: 18
N: 32(8, 1)

Octet Rule

• The Octet rule refers to the tendency of atoms to prefer to have ***8 electrons*** in the ***valence*** or ***outermost shell***. When atoms have fewer than 8 electrons, they tend to react to achieve a stable electronic configuration.

• Octet Rule was given by ***Lewis*** and ***Kossel*** in ***1916***.

Hybridization

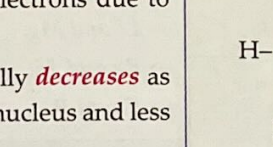
• The phenomenon of mixing up atomic orbitals of similar energies and formation of an equivalent number of entirely new orbitals of identical shape and energy is known as "hybridization" and the new orbitals so formed are called "hybrid orbitals".

• How to calculate:

Calculate the sum of Sigma bonds and the Lone pair of electrons, if the sum is:

2 - sp
3 - sp^2
4 - sp^3
5- sp^3d

E.g.



in this, 4 sigma bonds means hybridization -sp^3

Isoelectronic Species

• Isoelectronic species are atoms, ions, or molecules that possess the ***same number of electrons***, and therefore the ***same electronic structure***, even if they differ in nuclear charge.

E.g. Oxygen, Fluorine, Magnesium.

$_{8}O^{2-}$ $_{9}F^{-}$ $_{12}Mg^{2+}$
10 10 10

> *Atomic Mass is represented as: amu or u*

Calculation of Atomic Mass (A)

• When protons (Z) is ***even***, the number of neutrons (N) → ***2Z***.

• When protons (Z) is ***odd***, the number of neutrons (N) → ***2Z + 1***.

Exceptions

$_{1}H \rightarrow 1$, $_{4}Be \rightarrow 9$, $_{7}N \rightarrow 14$, $_{18}Ar \rightarrow 40$

Valency

• Valency is the combining capacity of an atom, indicating how many electrons and atom can ***lose, gain, or share*** to form a ***stable compound***.

$_{11}Na \rightarrow 2, 8, 1 \rightarrow 1$ e- $\rightarrow Na^{+} \rightarrow$ Losing an e-

$_{17}Cl \rightarrow 2, 9, 7 \rightarrow$ le- $\rightarrow Cl^{-} \rightarrow$ Gaining an e-

Variable Valency

• It is the ability of certain elements, particularly *transition metals*, to exhibit *more than one oxidation state* or *valency* in different compounds.

E.g. Fe → 2, 3; Ag; Cu (all transition metal show variable valency due to incomplete filling of f-orbitals).

Valence Electrons

• Valence electrons are the electrons present in the *outermost shell* (valence shell) of an atom. These electrons determine the chemical properties and reactivity of the element.

Valency Based on Valence Electrons

• If an element has *1, 2, 3 or 4* valence electrons → its valency is *equal* to the number of valence electrons. ***E.g. Elements in Group 1 (like hydrogen and sodium) have 1 valence electrons, so their valency is 1.***

• If an element has *5, 6, 7 or 8* valence electrons → its valency is calculated as: *8 – No. of valence electrons*. ***E.g. Elements in Group 16 (like oxygen and sulphur) have 6 valence electrons, so their valency is 8 - 6 = 2.***

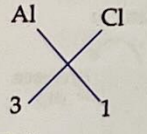
Name of Elements	Symbol	Atomic Number	Number of Electrons	Number of Protons	No. of Neutrons	Atomic Mass	Electronic Configuration				Valency
							K	L	M	N	
Hydrogen	H	1	1	1	-	1	1	-	-	-	1+,-
Helium	He	2	2	2	2	4	2	-	-	-	0
Lithium	Li	3	3	3	4	7	2	1	-	-	1+
Beryllium	Be	4	4	4	5	9	2	2	-	-	2+
Boron	B	5	5	5	6	11	2	3	-	-	3+
Carbon	C	6	6	6	6	12	2	4	-	-	4+
Nitrogen	N	7	7	7	7	14	2	5	-	-	3-
Oxygen	O	8	8	8	8	16	2	6	-	-	2-
Fluorine	F	9	9	9	10	19	2	7	-	-	1-
Neon	Ne	10	10	10	10	20	2	8	-	-	0
Sodium	Na	11	11	11	12	23	2	8	1	-	1+
Magnesium	Mg	12	12	12	12	24	2	8	2	-	2+
Aluminum	Al	13	13	13	14	27	2	8	3	-	3+
Silicon	Si	14	14	14	14	28	2	8	4	-	4
Phosphorus	P	15	15	15	16	31	2	8	5	-	3-
Sulphur	S	16	16	16	16	32	2	8	6	-	2-
Chlorine	Cl	17	17	17	18	35.5	2	8	7	-	1-
Argon	Ar	18	18	18	22	40	2	8	8	8	0
Potassium	K	19	19	19	20	39	2	8	8	1	1+
Calcium	Ca	20	20	20	20	40	2	8	8	2	2+

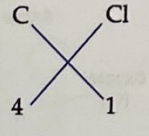
Electronic Configuration of Elements

Writing Chemical Formula of a Compound

E.g.

Aluminium Chloride: $AlCl_3$ ***Carbon Tetrachloride: CCl_4***





Duet Rule

• Duet Rule states that atoms like *Hydrogen (H)* and *Helium (H)* achieve stability when they have two electrons in their valence shell (***K shell***). To attain this stable configuration, atoms, either gain, lose, or share electrons by forming bonds with other atoms.

E.g. In a water (H_2O)molecule, hydrogen shares electrons with oxygen to achieve a stable duet configuration.

CONCEPT OF ATOMICITY

Atomicity

• Atomicity is the number of atoms present in a single molecule of an element or compound.

Diatomic Molecules

• The substances that have *two atoms* in their molecules are called diatomic molecules.

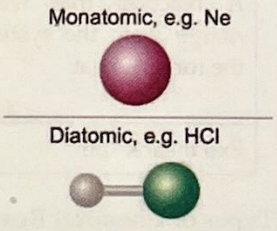
• There are only 7 elements that form *stable homonuclear diatomic molecules* and mostly exists as gases.

• They are: ***Oxygen, Nitrogen, Hydrogen, Chlorine, Fluorine, Bromine, and Iodine.*** So diatomic is atomicity of non-metals too.

Monoatomic Molecules

• The substances that are made up of *single atom* and *lacks any covalent bond* are called monoatomic molecules.

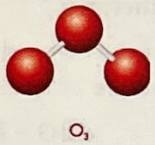
E.g. Helium, Neon, Argon, Krypton, Xenon, Radon.



Triatomic Molecules

• The substances formed of molecules that are made up of *three atoms* are called triatomic molecules.

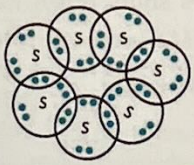
E.g. Water, Carbon dioxide, Hydrogen cyanide.



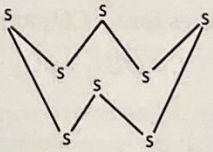
Ozone is triatomic

Polyatomic Molecules

• All the molecules that are made up of *four or more atoms* are known as polyatomic molecules. ***E.g. One molecule of sulphur is made up of 8 atoms, and one molecule of phosphorus is made up of 4 atoms. So both sulphur and phosphorus are polyatomic molecules.***



Ring structure of S_8 molecules



Crown shape of S_8 molecule

Extra Pointers

• Gas smells like a rotten egg: Hydrogen Sulphide (H_2S).

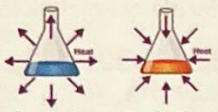
• Hydrogen gas burns with a pop sound.

• ***Brisk effervescence of CO_2:*** The rapid, vigorous evolution of carbon dioxide gas, producing audible fizzing and bubbles, typically indicating a chemical reaction between an acid and a carbonate/bicarbonate.

• Bhopal gas tragedy: 3 December 1984, gas- methyl isocyanate, in a factory named- Union Carbide India ltd.

CHEMICAL REACTIONS

• Chemical reactions are processes where substances *(reactants)* transform into new substances *(products)* through the breaking and forming of chemical bonds.



Exothermic *Endothermic*

• *They can be classified as:* *Exothermic and Endothermic Reactions.*

Exothermic Reactions and Endothermic Reactions

Exothermic Reactions	*Endothermic Reactions*
A reaction that *releases energy* from the system in the form of heat	A reaction in which the system *absorbs energy* from its surrounding in the form of heat
Exo means "out"	Endo means "in"

Types of Chemical Reaction

1. Combination Reaction (most combination reactions are exothermic)

• It is a chemical reaction where a *single product* is formed from *two or more reactants*.

$$CaO + H_2O \rightarrow Ca(OH)_2(aq) + Heat$$

Quick Lime *Slaked Lime* *(It is an exothermic reaction)*

Neutralisation is an exothermic reaction. E.g. mixing acid and alkali.

• $Ca(OH)_2$ reacts slowly with CO_2 in the air to form thin layer of $CaCO_3$ (Calcium carbonate gives shiny finish to walls). Other names for $CaCO_3$ are: *Chalk/Marble/Limestone*.

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

Lime water

CO_2 turns lime water milky.

Other Examples of Exothermic Reactions

2. *Burning of coal* (Combustion and Combination Reaction).
3. *Burning of natural gas* {Primary component: CH_4 (methane)}.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Methane

4. *Burning of magnesium ribbon* (Combination Reaction).

$$2Mg + O_2 \rightarrow 2MgO + Heat + Light \text{ (white dazzling light)}$$

Magnesium *Magnesium Oxide*

(White ppt formed)

atmospheric O_2 to form MgO, which prevents further reaction with O_2.

Mg is used in fireworks because it burns very hot and bright.

5. *Respiration is also an exothermic reaction.*

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + Energy$$

Glucose

2. Combustion Reaction

• It is a type of chemical reaction, where a substance reacts with *oxygen gas* releasing energy in the form *light* and *heat*.

$$C + O_2 \rightarrow CO_2$$

• Combustion reaction always takes place in *presence of oxygen*.

3. Decomposition Reaction

• It is a type of chemical reaction, where *single compound* breaks down into *two or more* simpler products, often requiring energy in the form of *heat, light, electricity*.

(a) Thermal Decomposition

Heat: Δ

1. $2FeSO_4 \xrightarrow{\Delta} Fe_2O_3 + SO_2(g) + SO_3(g)$ *(Endothermic)*

Ferrous Sulphate *Ferric Oxide*

2. $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

Oxygen was discovered by: Joseph Priestley

3. $2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 4NO_2(g) + O_2(g)$

Lead Nitrate *Lead Oxide* *(Brown Fumes of NO_2)*

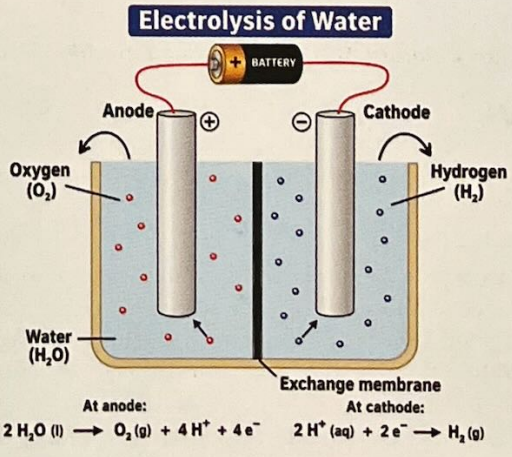
(b) Electrolysis

Electrolysis of water

$$2H_2O \rightarrow 2H_2 + O_2$$

At Cathode | *At Anode*

**H_2 gas collected is double the amount of O_2*



• *Water used in electrolysis:* Pure water, acidified water, distilled water.

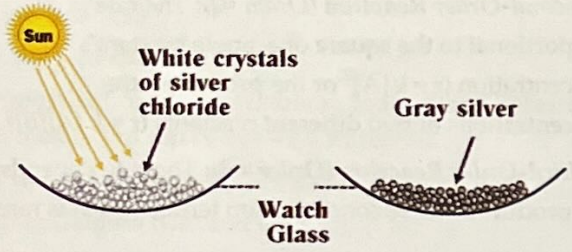
(c) Photolysis

$2AgCl \xrightarrow{\text{sunlight}} Ag + Cl_2$

$2AgCl \xrightarrow{\text{sunlight}} Ag + Br_2$

They are kept in dark bottle

AgCl and *AgBr* is used in *black* and *white* photography. A photogenic film is coated with the chemicals. When light falls on the surface of the film, the exposed part of the film is *darkened* from which photograph is developed.



(a) Before Decomposition **(b) After Decomposition**

4. Displacement Reaction

• It is a type of chemical reaction in which a *more reactive element displaces a less reactive element* from its compound. *E.g. Zn and Pb are more reactive element than Cu.*

$$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$$

$$Pb + CuCl_2 \rightarrow PbCl_2 + Cu$$

$$Mg\,(s) + ZnSO_4(aq) \rightarrow MgSO_4(aq) + Zn\,(s)$$

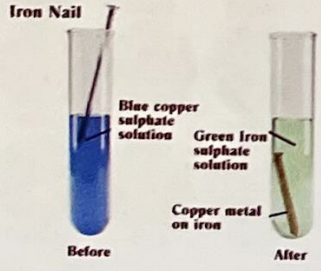
Reactivity Series

Potassium (K)
Sodium (Na)
Calcium (Ca)
Magnesium (Mg)
Aluminium (Al)
Zinc (Zn)
Iron (Fe)
Lead (Pb)
Hydrogen (H)
Copper (Cu)
Mercury (Hg)
Silver (Ag)
Gold (Au)

Reactivity decreases

$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

**The colour of $CuSO_4$ solution changes when an iron nail is dipped in it. The iron nail becomes brownish and blue colour of $CuSO_4$ turns green.*



5. Double Displacement Reaction

• It is a type of chemical reaction in which two compounds *exchange their ions* to form two new compounds. It is also sometimes called *Precipitation Reaction* when one of the products is an *insoluble solid* (precipitate).

$$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + NaCl$$
(White ppt)

$$Pb(NO_3)_2 + KI \rightarrow PbI_2 + KNO_3$$
(Yellow ppt)

$$Ba(OH)_2 + NH4Cl \rightarrow BaCl_2 + NH_4OH$$ *(Endothermic)*

6. Oxidation Reaction

• Oxidation reaction is *addition of oxygen* and *removal of hydrogen.*

Reduction

$Fe + O_2 \xrightarrow{H_2O} Fe_2O_3$

Oxidation

7. Reduction Reaction

• Reduction reaction is *removal of oxygen* and *addition of hydrogen.*

Reduction

$PbO + C \rightarrow 2Pb + CO_2$

Oxidation

Oxidizing Agent (Oxidant): *PbO because it gives oxygen to carbon.*
Reducing Agent (Reduction): *C because it removes oxygen from PbO.*

Redox Reaction

• A *redox (oxidation-reduction) reaction* is a chemical process in which *electrons are transferred* between chemical substances.

• In redox reaction, one substance *being oxidized (losing electrons)* and another being *reduction (gaining electrons).*

• The *oxidised* substance is called *reducing agent* since it facilitates by *donating electrons,* while the *reduced* substance is the *oxidising agent,* as it *accepts electrons.*

$$Cr_2O_7^{-2} + SO_3^{2-} \rightarrow Cr^{3+} + SO_4^{2-}$$

+6 +4 +3 +6

Reduction *Oxidation*

Corrosion

• A corrosion is a process of deterioration of metal as a result of its reaction with *air or water* (present in environment) surrounding it.

E.g. $4Fe + 3O_2 + xH_2O \rightarrow 2Fe_2O_3 \,.\, xH_2O$

→ When iron corrodes or rust, iron molecules react with oxygen molecules to form ***iron oxide***. Rust is a ***reddish brown, flaky substance*** that forms on the surface of the iron. Technically, a rust is ***Hydrated Iron (III) Oxide*** whose chemical formula is $Fe_2O_3 \cdot xH_2O$. Corrosion of iron is commonly known as ***rusting***.

$$2Cu + H_2O + CO_2 + O_2 \rightarrow Cu(OH)_2 + CuCO_3$$

→ Copper metal when ***exposed to air turns green*** in color due to corrosion. When the copper vessel is exposed to air in the rainy season, the metal reacts with ***gases, moisture*** and ***atmospheric gases*** to form a mixture of $CuCO_3$ and $Cu(OH)_2$. This gives a green color to the surface of Copper metal.

> ***Note**
> **Hydrogen has more than one oxidation number; +1 and –1.***

Rancidity

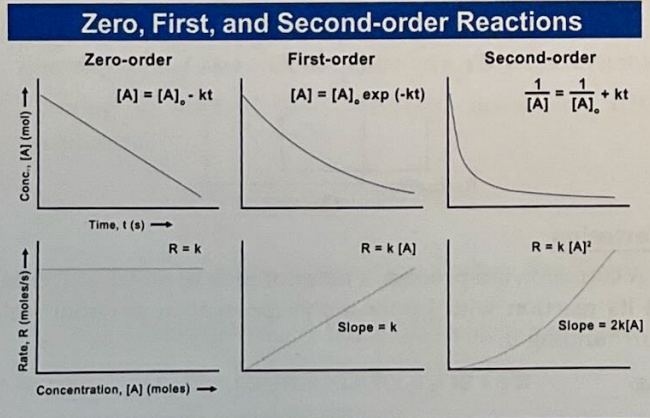
- It is a type of ***oxidation reaction.***
- It is the process by which ***fats and oils*** in food breakdown, resulting in unpleasant ***smell, taste,*** or ***texture***. ***E.g. Nitrogen gas is used in chips packets to prevent oxidation, which may cause chips to become stale and soggy.***

Calculation of Oxidation Number

$\overset{x}{N_2O_5}$	$2x + 5(-2) = 0$	$2x - 10 = 0$	$x = 5$
$\overset{x}{CaO}$	$x + (-2) = 0$		$x = 2$
$\overset{x}{MnO_2}$	$x + (-2) \times 2 = 0$		$x = 4$
$\overset{x}{NaAlH_4}$	$1 + x + 4(-1) = 0$	$x + 1 - 4 = 0$	$x = 3$
$\overset{x}{H_2S_2O_7}$	$(-2) + 2x - 14 = 0$	$2x = 16$	$x = 8$

x: Oxidation state

Order of reactions:



Primary Types of Reaction Order

- ***Zero-Order Reaction (Order = 0):*** The rate is independent of the reactant concentration ($r = k$) The rate remains constant, regardless of how much reactant is added.
- ***First-Order Reaction (Order = 1):*** The rate is directly proportional to the concentration of only one reactant ($r = k$ [A]). The rate depends linearly on concentration.
- ***Second-Order Reaction (Order =2):*** The rate is proportional to the square of a single reactant's concentration ($r = k$ [A]^2 or the product of the concentrations of two different reactants ($r = k$ [A][B])
- ***Third-Order Reaction (Order = 3):*** The rate depends on the product of three concentration terms, which is rare.

METALS

- They are generally solids.

Exception: Mercury (Hg) is liquid in room temperature, while Caesium (Cs) and Gallium (Ga) have melting points just above room temperature (28.5°C and 30°C, respectively).

- They have a metallic lustre (shine).

Exception: Lead (Pb).

- They are generally hard.

Exception: Alkali metals like Lithium, Sodium, and Potassium are soft metals and can be cut with a knife.

- They have high melting point and boiling point.

Exception: Gallium (Ga) and Caesium (Cs).

- They are malleable in nature (gold (Au) and silver (Ag) are most malleable metals). ***E.g, Sweets coated with thin sheets of Ag foil.***

Exception: Mercury (Hg → liquid), Na (soft), K (soft), Zn (brittle).

- They are ductile in nature (Au is most ductile)

Exception: Hg, Na, K, Zn.

- They are sonorous in nature. They make or produce sound. ***E.g. School bells, temple bells, etc.***

- They have high density. Osmium has the highest density.

Exception: Sodium (Na) and Potassium (K) float in water.

- They form alloys by combining with other metals or nonmetals. ***E.g. Stainless steel alloy of Nickel (Ni), Chromium (Cr), and Iron (Fe).***

German silver, also known as "Nickel silver" is an alloy of Copper (Cu), Zinc (Zn) and Nickel (Ni).

- Metals are good conductors of heat and electricity (free electrons are required for conduction of electricity).

Exception: Pb and Hg.

- They exhibit cationic properties.

- Metals form metal oxides when they react with oxygen.

Generally, all metallic oxides are basic in nature.

NON-METALS

- They are generally solids or gases.

Exception: Bromine (liquid at room temperature).

- They are non-lustrous in nature.

Exception: Iodine, Diamond, Graphite.

- They are brittle and generally soft in nature.

Exception: Diamond which is the hardest substances on earth.

- They have low melting point and boiling point.

Exception: Diamond, Graphite, Silicon, Carbon, Boron.

- They are not malleable in nature.

Malleability

- Malleability is a physical property of metals that defines their ability to be hammered, pressed, Or rolled into thin sheets without breaking. ***E.g. Similar to gold, silver is also highly malleable and can be shaped into various forms, including thin foils, and jewellery.***

- They are non-ductile in nature.

Ductility

- Ductility is a material's ability to be stretched or drawn into a thin wire or other elongated shape without breaking, meaning it can undergo significant deformation under tensile stress. ***E.g. Gold, due to its high ductility, 1 gm gold can be drawn into a wire that is about 2 km long.***

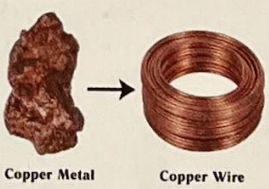
- They are non-sonorous in nature.

- They have low density.

Exception: Diamond.

- They do not form Alloys.

Exception: Carbon is alloyed with iron to form steel.

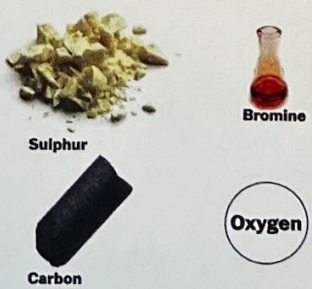


- They are bad conductor of heat and electricity.

Exception: Graphite which is a good conductor of electricity.

- They show anionic properties.

- Non-metals form non-metal oxides when they react with oxygen. Generally, all non-metallic oxides are acidic in nature.



Metalloids

• Metalloids are elements that have properties of *both metals* and *non-metals*.

• There are 7 metalloids: *Boron, Silicon, Germanium, Arsenic, Antimony, Tellurium, and Polonium*.

Chemical Properties of Metals

1. Reaction with Oxygen

• Burning in air or formation of *oxides* (Combustion).

• Almost all metals combine with oxygen (or air) to form *metal oxides*.

E.g. *Metal + Oxygen → Metal Oxides*

(i) $4Al + 3O_2(g) \rightarrow 2Al_2O_3(s)$ *(ii)* $2Cu(s) + O_2 \rightarrow 2CuO(s)$

Aluminium Oxide *Copper Oxide*

• Generally, metal oxides are basic in nature.

Amphoteric Oxides

• Amphoteric oxides are compounds that can react with *both acids and bases*, exhibiting both acidic and basic properties, and forming salts and water in these reactions. *E.g. Zinc oxide, Aluminium oxide.*

$$Al_2O_3 + HCl \rightarrow AlCl_2 + H_2O$$

Acid *Salt + Water*

$$Al_2O_3 + NaOH \rightarrow NaAlO_3 + H_2O$$

Base *Sodium Aluminate*
Salt + Water

Other examples with TRICK

Suno: SnO (Tin oxide)
Be: BeO (Beryllium oxide)
Zanabe: ZnO (Zinc oxide)
Ali: Al_2O_3 (Aluminium oxide)
Phir: PbO_2 (Lead oxide)
Milenge: MnO_2 (Manganese oxide)
Gali main: Ga_2O_3 (Gallium oxide)

• Most metal oxides are *insoluble in Water*.

• Some metal oxides are soluble in water and form *alkali* like *Sodium Oxide (Na_2O); Potassium Oxide (K_2O)*.

Reactivity of Different Metals towards Oxygen

Sodium (Na) and Potassium (K)

• These two metals react *vigorously with oxygen* that they *catch fire if kept in open*. That is why Na and K are kept in *kerosene*.

Mg, Al, Zn, Pb

• At ordinary temperature, the surface of these metals gets covered with *thin layer of oxides*. This oxide layer protects them from further oxidation.

Iron

• Iron does not burn on heating, but iron filings *burn vigorously* when sprinkled in flame of burner.

Alkali: Those bases that dissolve in water.

Copper

• Copper does not burn, but on heating, it forms a *black layer of copper (II) oxide (CuO)*.

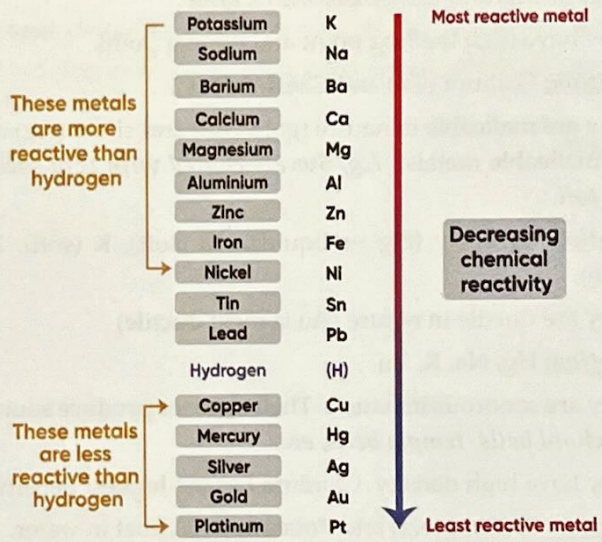
$$2Cu + O_2 \rightarrow 2CuO$$

**This black coating is responsible for tarnishing of copper objects over time.*

Silver (Ag) and Gold (Au)

• They *do not react with oxygen* even at high temperature.

Reactivity Series of Metals



Reaction of Metal with Water

Metals + Water → Metal Oxide + H_2 (g)

**All metals do not react with water*

Metal Oxide + Water → Metal Hydroxide

Metals	*Cold Water*	*Hot Water*	*Steam*
K, Na	Reacts vigorously + Exothermic (evolved H_2 gas catches fire)	✓	✓
Ca	Less violent reaction + Exothermic	✓	✓
Mg	✗	Mg starts floating because the bubbles of H_2 gas formed in the reaction stick to the surface of the metal	✓
Al, Fe, Zn	✗	✗	
Pb, Cu, Ag, Au	✗	✗	✗

Reactivity of Different Metals with Water

$$2K\,(s) + 2H_2O \rightarrow 2KOH\,(aq) + H_2(g) + Heat$$

$$2Na\,(s) + 2H_2O \rightarrow 2NaOH\,(aq) + H_2\,(g) + Heat$$

$$Ca\,(s) + 2H_2O \rightarrow Ca(OH)_2\,(aq) + H_2\,(g)$$

$$2Al\,(s) + 3H_2O \rightarrow Al_2O_3\,(aq) + 3H_2\,(g)$$

$$3Fe\,(s) + 4H_2O \rightarrow Fe_3O_4\,(s) + 4H_2\,(g)$$

Reaction of Metal with Acids

- Except a few *less reactive metals* (such as *Cu, Hg, Ag, Au, Pt, etc.*), all metals react with dilute *sulphuric acid* (H_2SO_4) and *hydrochloric acid* (HCl) to produce salt and hydrogen gas.

Reaction of Metal with Dilute Nitric Acid (HNO_3)

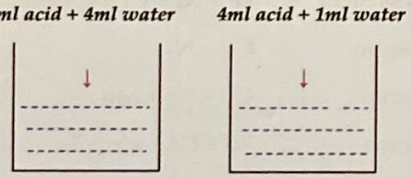
- Hydrogen gas is *not evolved* when a metal reacts with *nitric acid*.

$$Metal + Dilute\ acid \rightarrow Salt + Hydrogen$$

$$(M) + (A) \rightarrow (S) + (H)$$

$$Zn\,(s) + 2HCl\,(aq) \rightarrow ZnCl_2\,(aq) + H_2\,(g)$$

- This is due to *strong oxidising nature* of nitric acid.
- It oxidises the hydrogen, produced to water and itself gets reduced to any of the nitrogen oxide (NO, NO_2, N_2O).
- *Magnesium* (Mg) and *Manganese* (Mn) react with *dilute HNO* to evolve H_2.



$$Metal + HNO_3 \rightarrow Salt + NO/N_2\,O/NO_2$$

(Exceptional case: only for Mn and Mg)

$$Metal\ (Mn/Mg) + HNO_3 \rightarrow Salt + H_2$$

**Note: Copper does not react with dilute HCl*

Aqua Regia (Royal Water)

- It is a mixture of two strong acids in the ratio:

Concentrated HNO_3 : Concentrated HCl) = 1:3

- It is *highly corrosive* in nature.
- Aqua regia is able to dissolve *gold and platinum*.

Reaction of Metals with solutions of other Metal Salt

$$Metal_1 + Metal_2\ Salt \rightarrow Metal\ Salt_1 + Metal$$

Displacement Reaction

$$Cu\,(s) + 2AgNO_3\,(aq) \rightarrow Cu(NO_3)_2\,(aq) + 2Ag\,(s)$$

**The more reactive metal replaces the less reactive metal*

Chemical Properties of Non Metals

Reaction with Oxygen

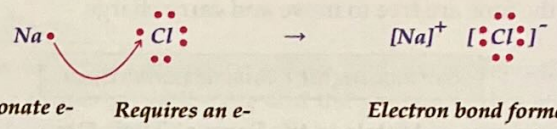
- Non-metals *do not react* with *water, steam or dilute acid*.
- The reason is that they act as an electron acceptor and *cannot accept H+ ions* of acids to reduce them to *hydrogen gas*.
- But on heating, they readily form oxides or salts with concentrated acids.

$$S\,(s) + 2H_2SO_4\,(conc.) \xrightarrow{\Delta} 3SO_2\,(g) + 2H_2O\,(l)$$

$$S\,(s) + 6HNO_3\,(conc.) \xrightarrow{\Delta} H_2SO_4\,(aq) + 6NO_2\,(g) + 2H_2O\,(aq)$$

Reaction between Metals and Non-metals Ionic Bond formation

Ionic Bond Formation of NaCl



Lewis Dot Structure of NaCl (electron dot structures)

Na configuration: 2, 8, 1
Cl configuration: 2, 8, 7

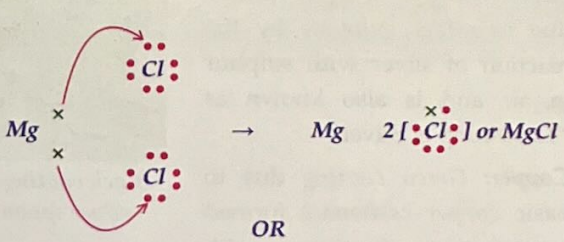
- When Na transfers an electron to Cl, it results in NaCl. Na atom with 11 electrons and *11 protons transfer* its single valence electron to Cl atom. Na becomes positively charged and Cl atom becomes negatively charged.

Electrovalent Bond

- An electrovalent bond, also known as an *ionic bond*, is a chemical bond formed by the *complete transfer of electrons from one atom* (usually a metal) *to another atom* (usually a nonmetal), resulting in the formation of oppositely charged ions held together by electrostatic attraction.

Ionic compounds show anisotropic properties.

Ionic Bond Formation of $MgCl_2$



$$Mg^{2+} + 2Cl^- \rightarrow Mg^{2+}2Cl^- \text{ or } MgCl_2$$

Lewis Dot Structure of $MgCl_2$ (electron dot structures)

Properties of Ionic Compounds

1. ***Physical Nature:*** Ionic compounds are hard crystalline solids because of *strong force of attraction* between

the *positive and negative ions*. These compounds are generally brittle and break into pieces when pressure is applied.

2. ***Melting and boiling points:*** These compounds have *high melting and boiling points* as large amount of energy is required to break strong inter-ionic attraction.
3. ***Solubility:*** These compounds are *soluble in water* (polar solvent) and *insoluble in organic solvents* (non-polar solvent) like kerosene, benzene, ether, petrol , etc.
4. ***Conduction of electricity:*** The conduction of electricity through a solution involves *movement of charged particle*. Ionic and electrovalent compounds are *good conductors of electricity*, but they conduct electricity either in *molten* form or in their *aqueous solution*, as the ions are free to move and carry charge.

Ore has: Metal + Gangue (impurities)

Occurrence of Metals in the Form of Their Ore

1. ***Aluminium: Bauxite, Cryolite***
2. ***Iron: Magnetite, Hematite, Limonite, Siderite***
3. ***Zinc: Zinc Blende/Sphalerite; Calamine; Zincite (Zinc)***
4. ***Mercury: Cinnabar***
5. ***Thorium: Monazite***
6. ***Sodium: Borax; Chile saltpeter ($NaNO_3$) and Indian saltpeter (KNO_3); Trona***
7. ***Lead: Galena***
8. ***Magnesium: Epsom salt ($MgSO_4 . 7H_2O$)***
9. ***Tin: Cassiterite***
10. ***Uranium: Pitchblende (it is made up of Uranium Oxide (UO_2)and variable proportions of Uranium trioxide (UO_3)***

Corrosion

1. ***Silver:*** *Black coating* is formed due to *silver sulphide* by the reaction of silver with sulphur in air and is also known as "Tarnishing of Silver"
2. ***Copper:*** *Green coating* due to basic *copper carbonate* formed by reaction of copper with carbon dioxide in air.
3. ***Iron:*** *Reddish brown* coating called *Rust*; iron corrode rapidly in *air and water*.

Black coating on silver spoons

Titanium is used for making Boat because it does not corrode in sea water.

Prevention of Corrosion

1. ***Galvanisation:*** Galvanisation is protecting steel and iron from rusting by coating them with a thin layer of zinc.
2. ***Anodising:*** It is an electrochemical process that creates a thick, protective oxide layer on aluminum (and its alloys) to enhance corrosion resistance and improve its appearance.

• Metals like aluminium, magnesium, titanium can undergo anodization to form a protective oxide layer.

• Anodising process is used in aircraft industry.

Fact
Aluminium is more reactive than iron, yet it is less easily corroded because it forms a protective oxide layer (Al_2O_3) when exposed to oxygen.

Formation of Alloy

Brass	Cu (80%) + Zn (20%)
Bronze	Cu (88%) + Sn (12%)
Solder	Sn + Pb
Bell Metal	Cu + Sn
Gun Metal	Cu + Sn + Zn
Amalgam	Hg + other metals
Stainless Steel	Fe + Ni + Cr + Carbon
Constantin	Cu + Ni
Manganin	Cu + Ni + Mn
Nichrome	Ni + Cr + Mn + Fe
German Silver	Cu + Ni + Zn
White Gold	Au (75%) + Ni + Pd
Magnalium	Al(95%) + Mg
Duralumin	Al (95%) + Mg + Mn + Cu

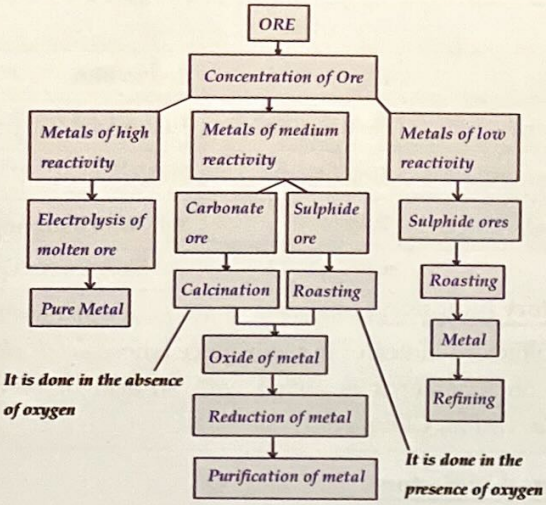
Steps Involved in Extraction of Metals from Ores Metallurgy

• Metallurgy is the science of *extracting metals from their ores* and refining them into pure metals and alloys.

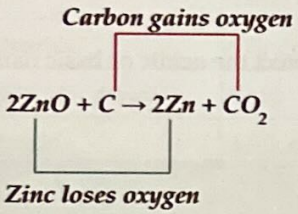
• White gold was originally developed to imitate platinum (a naturally white metal).

• Jewellery made of gold is an alloy. Pure gold has (22 parts of Au + 2 parts of Cu/Ag).

• Amalgam: An amalgam is a metal alloy of mercury with one or more metals.

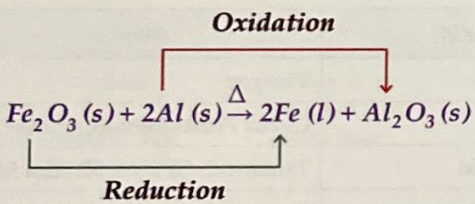


Reduction of Metal



Thermite Reaction

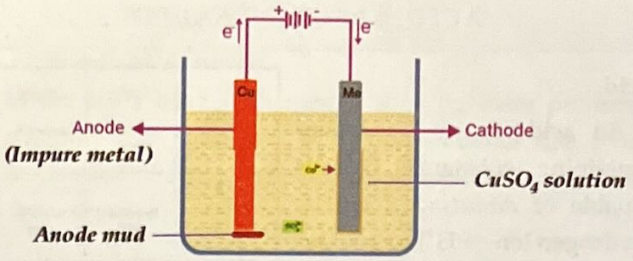
• It is a type of reaction in which a metal oxide is reduced by using *aluminium* as the *reducing agent*. It is generally *exothermic* in nature.



E.g. Railway tracks are joined using thermite reaction.

Electrolytic Refining

• It is a process that uses electricity to purify impure metals. An impure metal is used as *anode* and a pure metal is used as *cathode*. A solution of a metal salt is used as *electrolyte*. When an electric current is passed through the cell, the impure metal dissolves into the electrolyte and is replaced by an equal amount of pure metal from the cathode.



• The *pure metal* is deposited at the *cathode*, while the *insoluble impurities* from the impure metal settle down beneath the *anode* as *anode mud*.

Hydraulic Washing

• This method is a physical process based on the difference in the specific gravities (densities) of the ore and the gangue particles

Froth Floatation

• This is a physical process based on the differential wetting properties of the ore and the gangue with water and oil, used primarily for sulphide ores

Leaching

• It is a chemical method used when the ore is soluble in a particular solvent while the impurities are not. Best for- Gold and silver.

Calcination

• The process of heating concentrated ore strongly in the absence of limited supply of air to decompose the carbonates into oxides and expel CO_2 or moisture, primarily used for Carbonate ores or hydrated ores.

Extra pointers

• Pure metal with highest electrical resistivity: Tellurium

• Alloy with highest electrical resistivity: Nichrome.

• Water is a good solvent for dissolving ionic compounds because it has a high dipole moment.

• Pyrite: Commonly known as "fool's gold" due to its metallic luster and brass-yellow hue, is a fascinating mineral with the chemical formula FeS_2 (Iron Disulphide). It was the primary source for producing Sulphuric Acid.

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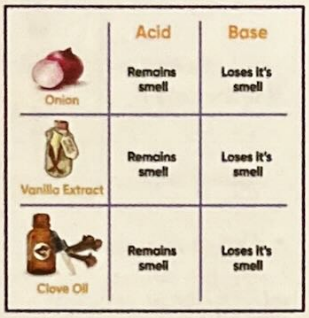
ACID, BASE AND SALT

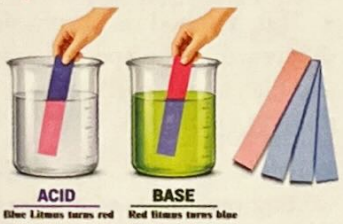
Acid



- An acid is any hydrogen-containing substance that is capable of *donating a proton* (hydrogen ion → H^+) to *another substance.*
- Acids are usually identified by their *sour taste.*
- An acid turns *blue litmus paper red.*

Base

- A base is a molecule or ion able to *accept a hydrogen ion* from an acid.
- A base turns *red litmus paper blue.*



Litmus is a purple dye, which changes its colour when interacted with acid or base.

Acid-Base Indicators

1. *Natural Indicators:*

   Natural indicators are substances, often derived from *plants*, that change color in the *presence of acids or bases*, indicating their acidic or basic nature.

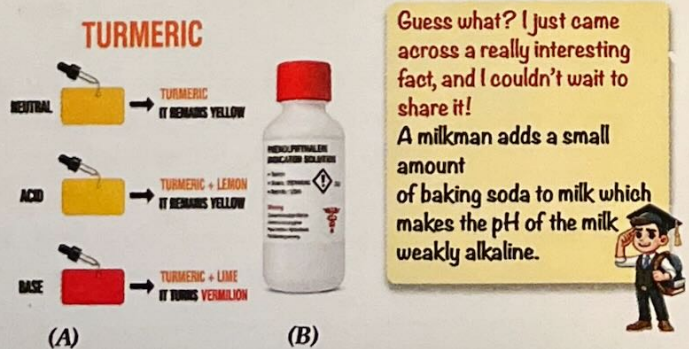
E.g.

1. ***Litmus:*** It is extracted from *Lichen* (Thallophyte).
2. ***Turmeric:*** It is a natural dye *Circumin* is present in it.
3. ***Coloured petals:*** Coloured petals of Hydrangea, Petunia, Geranium, Red Cabbage, China Rose, etc.

2. *Synthetic Indicator:* Synthetic indicators are acid-base indicators that are *man-made* or *synthesized* in a laboratory.

E.g.

1. ***Phenolphthalein:*** It is *colourless* in acidic solutions but *turns pink* in *basic solutions.*
2. ***Methyl Orange:*** It is red in *acidic solutions* and *yellow* in *basic solutions.*



(A) Natural Indicator; (B) Synthetic Indicators

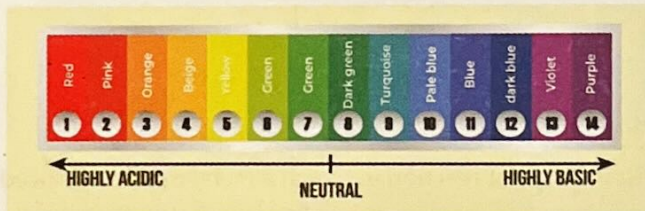
	Acid	*Base*
Litmus	Blue to Red	Red to Blue
Turmeric	Remains yellow	Turn to reddish brown
Phenolphthalein	Colourless	Pink
Methyl orange	Red	Yellow (a bit orangey)

Olfactory Indicators

- An olfactory indicator is a substance whose *smell changes* based on whether it is mixed with an acid or base. ***E.g. Vanilla, Onion, Clove, etc.***

Universal Indicators

- A universal indicator is a mixture of different types of indicators that *exhibits different coloration* at *different levels.*
- It is used to detect the acidic or basic nature of a substance or a solution.



Organic Acids

- *Acids Produced from organic sources:*

Acid	*Sources*
Acetic Acid	Vinegar
Citric Acid	Citrus Fruits (lemon, orange)
Tartaric Acid	Tamarind, Grapes, Kaccha Mango
Oxalic Acid	Tomato, Spinach
Lactic Acid	Curd
Ascorbic Acid	Citrus Fruits, Amla
Methanoic/Formic Acid	Ant Sting, Nettle Sting
Butyric Acid	Rancid Butter
Stearic Acid	Oil/ Fats
Malic acid	Apple, Banana
Lauric Acid	Coconut milk
Euric Acid	Mustard oil

Mineral Acids

- A mineral acid or an inorganic acid is any acid derived from an *inorganic compound* that dissociates to produce *hydrogen ions* (H^+) in water.

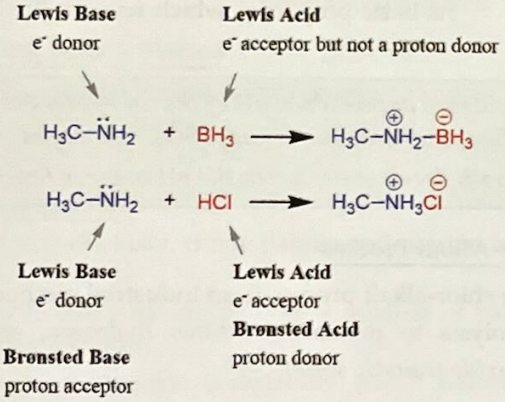
Acid	Sources
Sulphuric Acid	Oil of Vitriol
Nitric Acid	Explosives
Hydrochloric Acid	Gastric Juice
Boric Acid	Antiseptic
Carbonic Acid	Soda Water
Phosphoric Acid	Fertilizers

Sulphuric acid is known as "King of Chemicals" because it is very corrosive in nature and more reactive than other acids.

Base

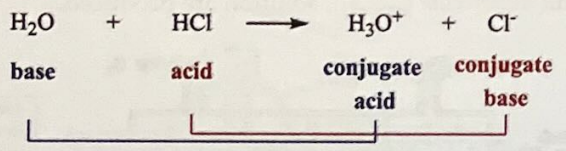
Base	Used In
Calcium Hydroxide	Lime Water
Ammonium Hydroxide	Window Cleaner
Sodium / Potassium Hydroxide	Soap
Magnesium Hydroxide	Milk of Magnesia

Lewis Acid and Lewis Base



Not every Base is a Brønsted Base and Any Acid is a Brønsted Acid

Conjugate Acid and Conjugate Base



In acid-base reactions, the acid is converted into its conjugate base, and the base is converted into its conjugate acid.

Note: If acid is weak then its conjugate base would also be weak.

Bronsted Lowry

• ***J N Bronsted and Thomas M Lowry*** independently suggested that acid- base reactions could be thought of as proton transfer reactions for the first time in ***1923***.

Chemical Properties of Acids and Bases

1. Reaction with Metals

• When acids react with metals, they typically produce a *salt* and *hydrogen gas*, while some metals like *zinc* and *aluminium* also react with bases to form a *salt* and *hydrogen gas*.

$$Acid + Metal \rightarrow Salt + Hydrogen\ gas$$

Burns with a pop sound

$$Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2\ (g)$$

$$Zn + NaOH \rightarrow Na_2ZnO_2 + H_2\ (g)$$

- *Sodium Hydroxide: Strong base*
- *Magnesium Hydroxide: Mild base*

2. Reaction of Metal Carbonate and Metal Hydrogen Carbonate with Acids

• When acids react with metal carbonates or metal hydrogen carbonates, they produce a *salt, carbon dioxide gas,* and *water*.

Metal Carbonate

OR $+Acid \rightarrow Salt + CO_2 + H_2O$

Metal Bicarbonate

$$Na_2CO_3 / NaHCO_3 + HCl \rightarrow NaCl + CO_2 + H_2O$$

Test of Carbon Dioxide

• *Carbon Dioxide (CO_2)* turns lime water milky because the carbon dioxide reacts with the *calcium hydroxide ($Ca(OH)_2$)* in the lime water, forming an insoluble white precipitate of *calcium carbonate ($CaCO_3$)*.

$$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$$

Calcium Hydroxide (lime water) — *Carbon dioxide* — *Calcium carbonate (white ppt)* — *Water*

↓

Turns lime water milky

• ***Burning Splinter Test:*** As carbon dioxide does not support combustion, the gas will extinguish a burning candle or matchstick placed near it.

Acid/Base in Water Solution

Conduction of Electricity

• Aqueous solutions of acids and bases conduct electricity because they contain charged particles (ions) that can move and carry an electric current, which is due to the dissociation of acids into *H^+ ions and bases into OH^- ions*.

• Distilled water, alcohol and glucose do not conduct electricity.

• All bases do not dissolve in water. ***E.g. copper (II) oxide.***

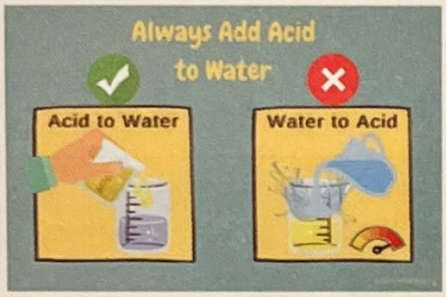
• An alkali is a base that dissolve in water.

• All alkali are bases, but all bases are not alkali.

Dilution of Acids

• While diluting an acid, it's safer to add *acid to water slowly* and with constant stirring than to add water to an acid. Adding water to acid can cause an extreme exothermic reaction that produces a large amount of heat which can cause the solution to boil, splatter, and cause burns.

$$\text{Concentrated Acid} \xrightarrow{To} \text{Diluted Acid}$$



Neutralisation Reaction

• A neutralization reaction is a type of acid-base reaction where an acid reacts with a base to form salt and water to *release heat* (exothermic reaction), essentially *"cancelling out"* each other's acidic or basic properties.

$$\text{Acid} + \text{Base} \rightarrow \text{Salt} + \text{Water} + \text{Heat}$$

$$\underset{\text{Basic}}{\text{Metal oxide}} + \text{Acid} \rightarrow \text{Salt} + H_2O$$

$$\underset{\text{Acidic}}{\text{Non-metal oxide}} + \text{Base} \rightarrow \text{Salt} + H_2O$$

$$\text{Strong Acid} + \text{Weak Base} \rightarrow \text{Salt (Acidic)} + H_2O$$

E.g. $Al(OH)_3 + HCl \rightarrow AlCl_3$ (Acidic salt) $+ H_2O$

$$\text{Weak Acid} + \text{Strong Base} \rightarrow \text{Salt (Basic)} + H_2O$$

E.g. $CH_3COOH + NaOH \rightarrow CH_3COONa$ (basic salt) $+ H_2O$

$$\text{Strong Acid} + \text{Strong Base} \rightarrow \text{Salt (neutral)} + H_2O$$

E.g. $NaOH + HCl \rightarrow NaCl$ (neutral salt) $+ H_2O$

$$\text{Weak Acid} + \text{Weak Base} \rightarrow \text{Salt (neutral)} + H_2O$$

E.g. $CH_3COOH + NH_4OH \rightarrow CH_3COONH_4$ (neutral) $+ H_2O$

pH Scale

• *"p"* stands for *"Potenz"* means *"Power"* in German language.

• pH scale was developed by *Lauritz Sorensen* (a Danish chemist).

• It is a universal indicator (a mixture of several indicators) and a logarithmic scale.

• It shows different colour at different hydrogen ion concentration.

• It measures H^+ *ion* concentration.

$$pH = -\log [H^+]$$

Importance of pH Scale in Everyday Life

• Human body works is a narrow pH range of *7-7.8.*

• pH scale is used in treatment of soil (*Quick lime/$CaCO_3$ / Slaked lime* is added to acidic soil).

• When soil is too basic, then *gypsum* is added to treat it.

Important pH Values

- *Gastric juice: 1.6*
- *Lemon: 2*
- *Milk: 6.4*
- *Blood: 7.4 (slightly alkaline)*
- *Saliva: 6.5*
- *Milk of Magnesia: 10*
- *NaOH:14*

• Antacids like $Mg(OH)_2$ → Milk of Magnesia, *baking soda, aluminium hydroxide* is used to treat indigestion when stomach produces too much HCl.

• pH levels help in self-defence in plants and animals.

1. *Bee sting:* It contains *methanoic acid/formic acid* (causes burning sensation when it comes in contact with skin).
   Remedy: A mild base like *Calamine lotion* (contains Zinc carbonate) is applied.
2. *Nettle plant leaves:* Sting of the hair of the nettle leaves contain *methanoic acid.*
   Remedy: The *juice of dock leaves* is applied due to its basic properties which relieves the burning or stinging sensation.

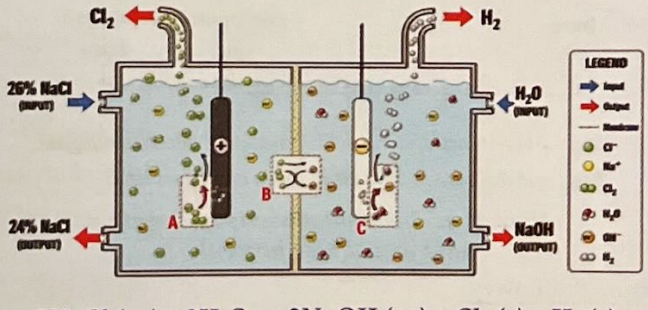
• *Acid rain occurs when pH of the rainwater drops below 5.6 {contains sulphur dioxide (SO_2) + nitrogen oxides}.*

• *Tooth decay starts when the pH value is less than 5.5.*

Chlor-Alkali Process

• The chlor-alkali process is an industrial method that uses electrolysis to produce *chlorine, hydrogen,* and *sodium hydroxide (caustic soda).*

• An aqueous solution of *sodium chloride (NaCl)* or *brine* is passed through an electrolytic cell. An electric current is passed through the solution. *Chlorine gas (Chlor)* and *sodium hydroxide (Alkali)* solution are produced.



$$\underset{\text{At Cathode}}{2NaCl\ (aq)} + \underset{\text{At Anode}}{2H_2O} \rightarrow \underset{\text{At Cathode}}{2NaOH\ (aq)} + Cl_2\ (g) + H_2\ (g)$$

Bleaching Powder

- Its chemical formula is *$CaOCl_2$ (calcium oxychloride/ calcium hypochlorite)*.
- It is commonly known as *Chlorinated Lime*.
- It is produced by the action of chlorine on dry *Slaked Lime ($Ca(OH)_2$)*.

$$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$$

Slaked Lime/Lime Water

Uses of Bleaching Powder

- It is used for bleaching cotton and linen clothes in textile industries.
- It is used for bleaching wood pulp in paper industries.
- It is used in laundry.
- It is used as an oxidising agent in chemical industry.
- It is used as a disinfectant for cleaning drinking water.

Baking Soda

- Its chemical formula is *$NaHCO_3$ (sodium bicarbonate)*.
- Sodium chloride, water, carbon dioxide, and ammonia react to produce *sodium bicarbonate ($NaHCO_3$)* and *ammonium chloride (NH_4Cl)*.

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NaHCO_3 + NH_4Cl$$

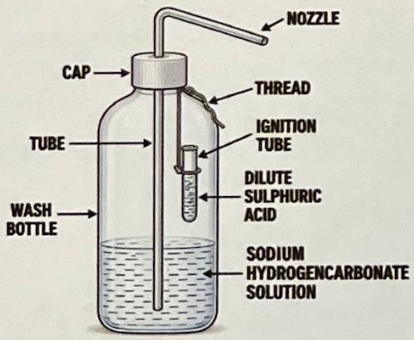
Sublime compound

When Baking Soda is Heated

- When baking soda is heated, it undergoes a decomposition reaction, breaking down into *sodium carbonate (Na_2CO_3)*, *water (H_2O)*, and *carbon dioxide (CO_2)*.

Uses of Baking Soda

- It is used to make tasty, crispy pakora and used in faster cooking.
- It is used to make baking powder = mixture of baking soda + mild edible acid.
- It is used as antacids (substances which neutralise stomach acidity).
- It is used in *soda-acid fire extinguisher (Dilute H_2SO_4 + $NaHCO_3$)*.



Soda-Acid Fire Extinguisher

When the fire extinguisher's knob is turned, the sulfuric acid and sodium bicarbonate react to produce carbon dioxide gas.

Washing Soda

- Its chemical formula is *$Na_2CO_3 . 10H_2O$ (hydrated sodium carbonate)*.

$$NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$$

$$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3 . 10H_2O$$

Uses of Washing Soda

- It is used in glass, soap and paper industries.
- It is used in manufacturing of borax *($Na_2B_4O_7 . 10H_2O$)*.
- It is used as a cleaning agent.
- It is used in removing permanent hardness of water.
- ***Hard water:*** It is a type of water that contains high levels of *calcium* and *magnesium* minerals.
- ***Heavy water (D_2O):*** It is a type of water that contains a higher concentration of *deuterium* (a heavy isotope of hydrogen) than regular water.

Plaster of Paris

- On heating *Gypsum* at *373 K*, it loses water molecules and form *Plaster of Paris* ($CaSO_4 . ½H_2O$ → *Calcium Sulphate Hemihydrate*).
- It is a white powder and on mixing with water, it changes to *Gypsum*.

$$CaSO_4 . ½H_2O + 1½H_2O \rightarrow CaSO_4 . 2H_2O$$

(Plaster of Paris) *(Gypsum)*

Uses of Plaster of Paris

- It is used to support *fractured bones*, forming a hard cast that *immobilizes the injured limb* while it heals.
- It is used for making toys, decorative materials, smooth surface of walls, etc.

> ***Note***
> *It is always stored in moisture proof container; as it absorbs moisture to form hard Gypsum.*

Some Other Salts

- ***Blue vitriol: $CuSO_4 . 5H_2O$*** *(it can be used to relieve mouth ulcers)*.
- ***Green vitriol: $FeSO_4 . 7H_2O$***
- ***White vitriol: $ZnSO_4 . 7H_2O$***
- ***Mohr's Salt: $(NH_4)_2Fe(SO_4)_2 . 6H_2O$***
- ***Alum: $KAl(SO_4)_2 . 12H_2O$***
- ***Epsom salt: $MgSO_4 . 7H_2O$***

> *Anhydrous $CuSO_4$ is white or pale green in colour and has a powdery appearance.*

CARBON AND ITS COMPOUND

Carbon Content

- *In earth's crust: 0.025%.*
- *In atmosphere: 0.03%.*

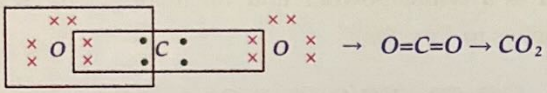
Basic Features of Carbon

Catenation	*Tetravalency*
Unique ability to form long chains of C-Cbond	Capability to form 4 bonds with other atom of carbon or other monovalent elements
No other element exhibit catenation property as much as Carbon	Carbon forms a strong and stable bond due to its small size

Carbon's Ability to Catenate

- The electronic configuration of carbon plays a key role in its ability to exhibit catenation. Carbon has a total of *6* electrons, with *2 in inner shell* and *4 in the outer shell*. Its small atomic size allows it to form stronger C-C bonds compared to other elements, making carbon the most effective element in catenation.

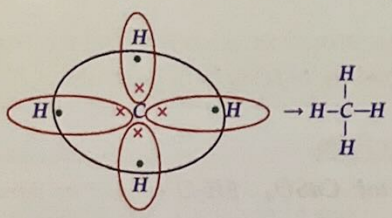
Bonding of Carbon with Oxygen



- Oxygen has *6 e-* and requires *2 more electrons* to complete its *Octet*. Carbon requires 4 more e- to complete its octet.

Bonding of Carbon with Hydrogen

- Carbon and hydrogen form a *covalent bond* (specifically, a nonpolar covalent bond) by sharing electrons, where carbon shares its outer valence electrons with up to *four hydrogens* to complete their outer shells and this allows both carbon and hydrogen to achieve stable electronic configurations.



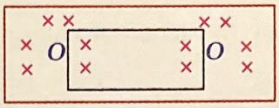
Covalent Bond

A covalent bond is a chemical bond that involves the sharing of electrons to form electron pairs between atoms.

Covalent compounds exhibit weak boiling and melting point because the intermolecular forces between their molecules are weak. Covalent bonds are usually formed between non-metals.

Oxygen

- Oxygen cannot form long chains of bonding like carbon because of its small size and high electronegativity, and because it lacks d-orbitals.



O_2

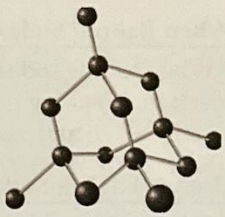
Allotropes of Carbon

Allotropy

- Allotropy is the property of some chemical elements to exist in two or more different forms, in the same physical state, known as allotropes of the elements.
- ***Allotropes of carbon are:*** *Diamond, graphite, fullerenes, graphene, etc.*

Diamond

- It has a *3D-tetrahedral* structure with *sp^3 hybridisation.*
- Diamond is a *bad conductor of electricity*.
- In the structure of diamond, each carbon atom is bonded to *4 other carbon atoms*.
- It can be synthesized by subjecting pure carbon to very *high temperature* and *pressure*.
- Diamond is the *hardest* naturally occurring substance.
- Diamond and crystalline silicon is *isomorphous*.
- It has the *highest refractive index (2.42)*.



Uses of Diamond

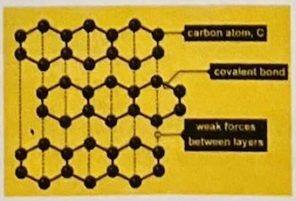
- It is used for cutting glasses.
- It is used for sharpening hard tools.
- It is used for manufacturing *Tungsten (W)* filament.

Isomorphous: It means having similar shapes or crystalline structures

Diamond is covalent, yet it has high melting point because it has 3D network involving strong C-C Bonds that are difficult to break.

Graphite

- It has a *2-D layered structure* (held by Van der Wall forces) and *sp^2 hybridisation*.
- It features carbon arranged in *hexagonal plane array*.
- Each carbon is bonded to three other carbon atoms, forming a hexagonal lattice.



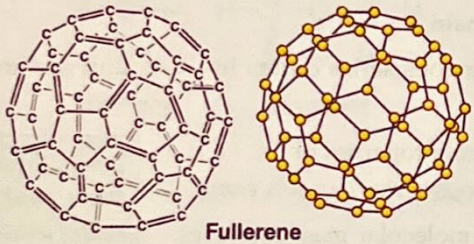
The fourth electron remains delocalized, contributing to electron conductivity.

- Graphite is a *good conductor of heat and electricity*.
- It is the *most stable* form of carbon.

Graphite is soft and slippery because it has a layered structure weakly bonded together because of which they could slide over each other and that is why mostly used in lubricants.

Uses of Graphite

- Graphite is used in making electrodes.
- It is used in pencil lead.
- It is used as a dry lubricant.
- It is used as a moderator for fast moving neutron in atomic reactors.



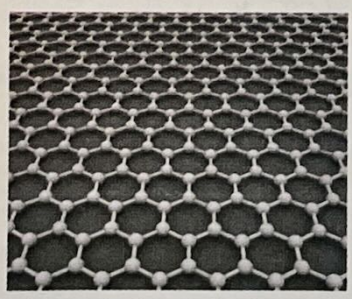
Fullerene

Fullerenes

- It is also known as *Buckminsterfullerene (C60)*.
- It is known for its *hollow, cage-like structures arranged* in patterns of *20 hexagonal rings* and *12 pentagonal rings*.
- A hexagonal ring can be fused with hexagonal or pentagonal ring, but a pentagonal ring can only be fused with hexagonal ring.
- It has sp^2 *hybridisation*.
- It contains both *single* and *double* bond with other *3 carbon atoms*.
- Fullerenes is the purest form of carbon.

Graphene

- Graphene is a *single-atom-thick layer* of carbon atoms arranged in a *hexagonal lattice,* making it the *thinnest* material known. It exhibits exceptional electrical and thermal conductivity, making it an outstanding material for various technological applications.



Graphene

HYDROCARBONS

Types of Hydrocarbons

Unsaturated Hydrocarbons

- More than 1 bond between carbon atoms
- Burns with yellow sooty flame

Alkenes/Olefins

E.g. Ethene (Double bonds)

Alkynes

E.g. Ethylene (Triple bonds)

- Other examples: Benzene, anthracene, camphor

Saturated Hydrocarbons

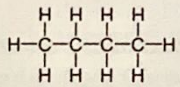
- Single bond between carbon atoms
- Gives clean blue flame however in limited supply of air gives sooty flame

Alkanes/Paraffins

E.g. Ethane (Single bond)

- Other examples: Hexane, alcohol, butane

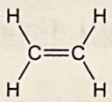
Alkanes → ane



Butane

- General Formula: CnH_{2n+2}

Alkene → ene

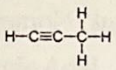


Ethene

- General Formula: CnH_{2n}

Alkyne → yne

General Formula: CnH_{2n-2}



Propyne

- *Ethene plays an important role in fruit ripening.*
- *LPG gas contains butane and propane.*
- *Acetylene/Ethylene is used for welding of metals.*

Naming of Hydrocarbons

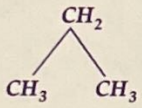
No. of Carbon atoms	*Prefix*
1	meth-
2	eth-
3	prop-
4	but-
5	pent-
6	hex-
7	hept-
8	oct-
9	non-

10	dec-
11	undecane-
12	dodecane-
13	tridecane-
14	tetradecane-
15	pentadecane-
16	hexadecane-
17	heptadecane-
18	octadecane-
19	nonadecane-
20	icosane-

E.g.

$CH_3\text{-}CH_2\text{-}CH_3$ → *Propane*

C_3H_6 → *Propene*



Bond-line structure of propane

International Union of Pure and Applied Chemistry (IUPAC)

- It is a scientific organization that is responsible for naming *hydrocarbons*.
- It publishes several books often referred to as *"IUPAC Color Books"*.
  - ***Blue Book:*** Nomenclature of *organic compounds.*
  - ***Red Book:*** Nomenclature of *inorganic compounds*

1 2 3 4 5

$CH_3\text{-}CH{=}C\text{-}CH_2\text{-}CH_3$ → *Pent-2-yne* — Nearest position for double/triple/functional group

$CH_3\text{-}CH_2\text{-}CH_2\text{-}C{=}CH_3$ → *1-Pentyne*

CH_3 → *Alkyl group*

$CH_3\text{-}CH(CH_3)\text{-}CH_2\text{-}CH_3$ → *2-Methyl Butane*

1 2 3 4

Look for continuous longest chain

CH_3 → *Methyl*

$CH_3\text{–}CH_2$ → *Ethyl*

$CH_3\text{–}CH_2\text{–}CH_3$ → *Propyl*

Root: It is the longest continuous chain of a compound

$CH_3\text{-}CH_2\text{-}CH(CH_3)\text{-}CH_2\text{-}CH_3$ → *3-Methyl Pentane*

$CH_3\text{-}CH_2\text{-}CH(CH_3)\text{-}C{\equiv}CH$ → *3-Methyl Pentyne*

Class of the compound	Functional group	Common Formula	Examples	*Suffix*	*Functional Groups*
Alcohol	— OH	R-OH	Ethanol, CH_3CH_2OH	*-ol*	*Ethanol*
Aldehyde	—C(=O)—H	R-CHO	Acetaldehyde, CH_3COH	*-al*	*Ethanal*
Ketone	—C(=O)—	R-CO-R	Acetone, CH_3COCH_3	*-one*	*Propanone*
Carboxylic acid	—C(=O)—OH	R-COOH	Acetic acid, CH_3COOH	*-oic*	*Ethanoic*
Ester	—C(=O)—OR	R-COOR	Methyl acetate, CH_3COOCH_3	*-oate*	*-COOR*
Ether	—O—R	R-O-R	Dimethyl ether, CH_3OCH_3		

Prefix is used here

Homologous Series

- It consists of one functional group, which decides the property of carbon compounds, regardless of length of carbon chain.
- Homologous series differs by $-CH_2$ unit and mass by *14 units.*
- Chemical properties of homologous series *remains same.*
- As the molecular mass increases, the *melting point* and *boiling point* also *increases.*

For halogens as functional groups prefix is used.

Homologous Series

Alkanes	Alkynes	Alcohols
CH_4	C_2H_2	CH_3OH
C_2H_6 (+CH_2)	C_3H_4 (+CH_2)	C_2H_5OH (+CH_2)
C_3H_8 (+CH_2)	C_4H_6 (+CH_2)	C_3H_8OH (+CH_2)
C_4H_{10} (+CH_2)	C_5H_8 (+CH_2)	$C_4H_9OHCH_2$ (+CH_2)

Isomers

- Isomers are chemical compounds that have *identical chemical formulae but differ in properties* and the *arrangement of atoms* in the molecule.

$CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_3$ → C_4H_{10} → *Butane*

$CH_3\text{-}CH_2\text{-}CH(CH_3)\text{-}CH_2\text{-}CH_3$ → C_6H_{14} → *3-Methyl Pentane*

TRICK for Identifying No. of Isomers: $2^{(n-4)} + 1$

Isomers In

- **Hexane:** $2^{(6-4)} + 1 = 2^2 + 1 = 5$
- **Heptane:** $2^{(7-4)} + 1 = 2^3 + 1 = 9$
- **Octane:** $2^{(5-4)} + 1 = 2^4 + 1 = 16 + 1 + 1 = 18$
- **Nonane:** $2^{(9-4)} + 1 = 2^5 + 1 = 32 + 1 + 2 = 35$

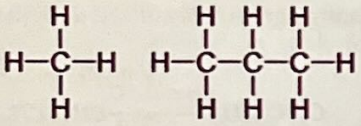
- *Single bond: made of one σ bond*
- *Double bond: made of one σ and one π bond*
- *Triple bond: made of one σ and two π bond*

Organic Compounds

- Organic compounds are represented by *four* main structural types: ***complete*** (all bonds shown), ***condensed*** (atoms grouped, bonds omitted), ***bond-line*** (zigzag lines, carbons implied), and ***wedge-and-dash*** (3D geometry).

Aliphatic/Acylic Compounds

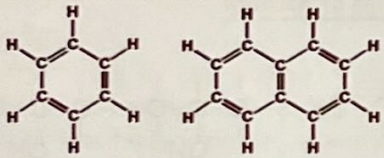
- They are *not aromatic* (lack ring structure). ***E.g. Alkane, Alkene, Alkyne (open chain compounds).***



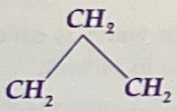
Methane **Propane**

Cyclic Compounds

- They are compounds that form a *ring structure*. ***E.g. Benzene, Naphthalene.***



Benzene **Naphthalene**

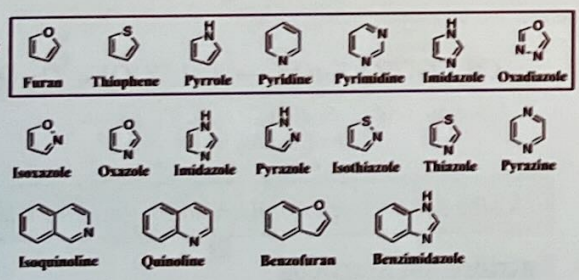


Cyclical Formula
- Alkane: CnH_{2n}
- Alkene: CnH_{2n-2}
- Alkyne: CnH_{2n-4}

Heterocyclic Compounds

- They are cyclic compounds that have atoms of *at least two different elements* in their ring structure.

***Important**



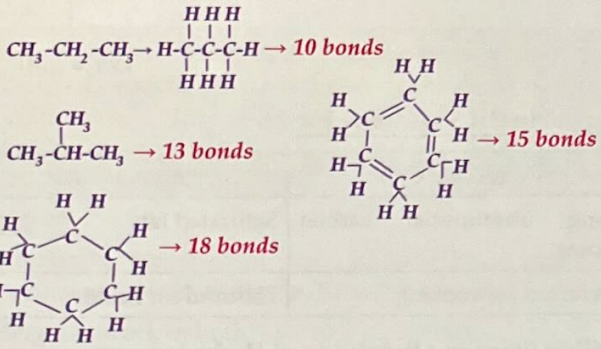
Aromatic Compounds

- They are group of compounds that have a cyclic conjugated structure and contain *(4n+2)* π electrons, making them particularly stable (Erich Huckel's Rule)

Benzene (*Simplest aromatic compound*)

Toluene (*Benzenoid aromatic compound*)

Number of Covalent Compounds



Chemical Properties of Carbon Compounds

1. **Combustion:** Carbon in all its allotropic form burns in *Oxygen* to give *Carbon Dioxide* along with the release of *Heat+ Light.*

Combustion:

$$CH_4 + 2O_2 \xrightarrow{\text{Combustion}} CO_2 + 2H_2O + Heat + Light$$

- *Octane number: It measures a fuel's ability to resist "knocking" or "pinging" during combustion in a spark-ignition engine. Higher numbers indicate higher resistance to auto-ignition.*

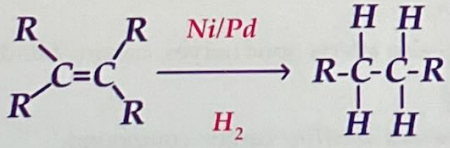
2. **Oxidation of Alcohol to Ethanoic Acid**

$$CH_3\text{-}CH_2\text{-}OH \xrightarrow[OR]{H^+/KMnO_4} \underset{\text{Ethanoic acid}}{CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}OH}$$

$KMnO_4$: *Potassium permanganate*
$K_2Cr_2O_7$: *Potassium dichromate*

**This reaction is carried out in presence of oxidising agent*

3. **Addition Reaction:** Unsaturated hydrocarbons add hydrogen in presence of *Catalyst (Ni, Pd)* to give saturated hydrocarbons.



4. **Substitution Reaction:** A hydrogen atom in a saturated hydrocarbon is replaced by a *chlorine* **atom, forming a**

chlorinated derivative and *hydrogen chloride*, often in the presence of *sunlight*.

$$CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} CH_3Cl + HCl \xrightarrow{\text{Sunlight}} CH_2Cl_2 + HCl$$

Methane (natural gas) Chloromethane

$$\xrightarrow{\text{Sunlight}} CHCl_3 + HCl \xrightarrow{\text{Sunlight}} CCl_4 + HCl$$

Chloroform

Vegetable Oil Vs Animal Fats

Vegetable Oil	*Animal Fats*
Long unsaturated carbon chains	Saturated fats
Preferred for cooking	Harmful for health

Boiling Point and Solubility of Hydrocarbons

• Alkynes generally have slightly *higher boiling point* than *alkenes* and *alkanes* (Alkyne > Alkene > Alkane) because of the stronger intermolecular forces arising from the triple bond.

$$CH_3{-}CH_3 < CH_3{-}CH_2{-}CH_3 < CH_3{-}CH_2{-}CH_2{-}CH_3$$

Ethane Propane Butane

• Alkenes have stronger intermolecular forces than alkanes due to the double bond, so their bonding point is higher than that of alkanes, but lower than alkynes.

• As the number of carbon in alkane increases, its boiling point increases significantly. Also, molecule with strong intermolecular forces will have high boiling points.

Solubility of Hydrocarbons

• Solubility *decreases* as the length of hydrocarbon chain *increases*.

$$C_2H_6 > C_3H_8 > C_4H_{10}$$

Important Carbon Compounds

1. Methanol

• Methanol also known as *Methyl alcohol* is also called *"wood spirit"* because it was obtained in the initial stage by the *destructive distillation* of *wood*.

• Intake of methanol in very small quantities can cause *death*. Methanol oxidises to *methanal in liver* and *coagulates protoplasm*.

• Methanol also affects optic nerves, causing blindness.

2. Ethanol

• It is a *pleasant smelling* carbon compound.

• It is an active ingredient in alcoholic drinks.

• Denatured spirit or alcohol is ethanol which is made unfit for drinking by adding poisonous substances like *methanol* that imparts a bad taste, foul smell, or colour. A *blue dye* is also added to it, so that it is easily recognized.

• It is soluble in water in all proportion.

• ***It is a good solvent and is used in medicines such as:***

1. Tincture of iodine
2. Cough syrups

Reactions of Ethanol

1. *Reaction with Sodium* → Evolution of *Hydrogen gas*.

$$C_2H_5OH + Na \rightarrow C_2H_5ONa + H_2\,(g)$$

Ethanol

2. *Dehydration of Ethanol*

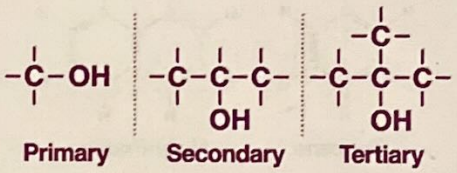
• On heating ethanol at *443K* with excess *Conc. Sulphuric acid* (Dehydrating agent), it results in dehydration of *ethanol to ethene*.

$$C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4} CH_2{=}CH_2$$

Ethanol Ethene

Alkyl group is also represented as -R

Different Types of Alcohol



3. *Ethanoic Acid (Acetic acid)*

• A *5-8% solution* of *acetic acid* in water is called *vinegar* and is used widely as a preservative in *pickles*.

• The melting point of pure ethanoic acid is *290K* and hence it often freezes during winters and is called *glacial acetic acid*.

1. Reaction with Base

• When *ethanoic acid* reacts with a base, it undergoes a *neutralization* reaction, forming a *salt (an ethanoate)* and *water*.

$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$$

Ethanoic acid Sodium hydroxide Ethanoate

Kolbe synthesised Acetic Acid for the first time.

2. Esterification Reactions

• In an esterification reaction, a *carboxylic acid reacts with an alcohol*, typically in the presence of an *acid catalyst*, to form an *ester* and *water*.

$$CH_3COOH + C_2H_5OH \rightarrow CH_3C\text{-}\overset{\overset{O}{\|}}{O}\text{-}C_2H_5 + H_2O$$

Carboxylic acid — Removal of water — Ester — Water

$-\overset{\overset{O}{\|}}{C}-OH$ -oic group

Ester

1. It is formed by reaction of *acid* and *alcohol*.
2. It is a *sweet smelling substance* used in making perfumes and flavouring agents.

Some other reactions:

- ***Maillard Reaction:*** It is the chemical process that browns food and creates savory flavors when heat causes sugars and proteins to react.
- ***Grignard Reaction:*** The Grignard Reaction is the addition of an organomagnesium halide (Grignard reagent) to a ketone or aldehyde, to form a tertiary or secondary alcohol, respectively. The reaction with formaldehyde leads to a primary alcohol.
- ***Grignard Reagent:*** R-Mg-X. (where R is an alkyl/aryl group and X is a halide).
- ***Sandmeyer reaction:*** An organic reaction used to convert an aryl diazonium salt into an aryl halide using a copper(I) halide catalyst.

Soap and Detergents

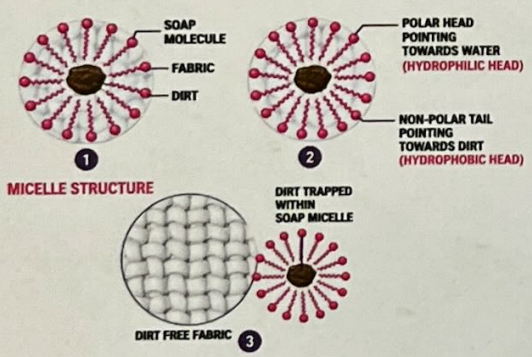
Saponification Reaction

• This reaction is used in preparation of soaps. In this reaction, an *ester* is treated with a *base* (like sodium hydroxide) that breaks it down into an *alcohol* and a *sodium salt* of a *carboxylic acid.*

• The ester is converted back to alcohol and sodium salt of carboxylic acid.

$$CH_3COOC_2H_5 \xrightarrow{NaOH} CH_3COONa + C_2H_5OH$$

• Soaps are cleansing agents that are *sodium or potassium salts* of *long-chain carboxylic acids* (also known as fatty acids).



• Soap obtained remains in *colloidal form* and is precipitated from solution by adding *NaCl*.

• The solution left after removing the soap contains *glycerol* which is later recovered by *fractional distillation*.

Soap does not work in

- **Hard water** ↓ Because in hard water it reacts to form Calcium & Magnesium salts, which are an insoluble substance called Scum.
- **Acidic condition** ↓ Because it forms insoluble long chain fatty acids.

Cleansing action of soap is due to formation of micelles. It forms an emulsion in water and does not come together to precipitate because of ion-ion repulsion. Soap micelle shows Tyndal Effect, thus soap solution appears cloudy.

Detergents

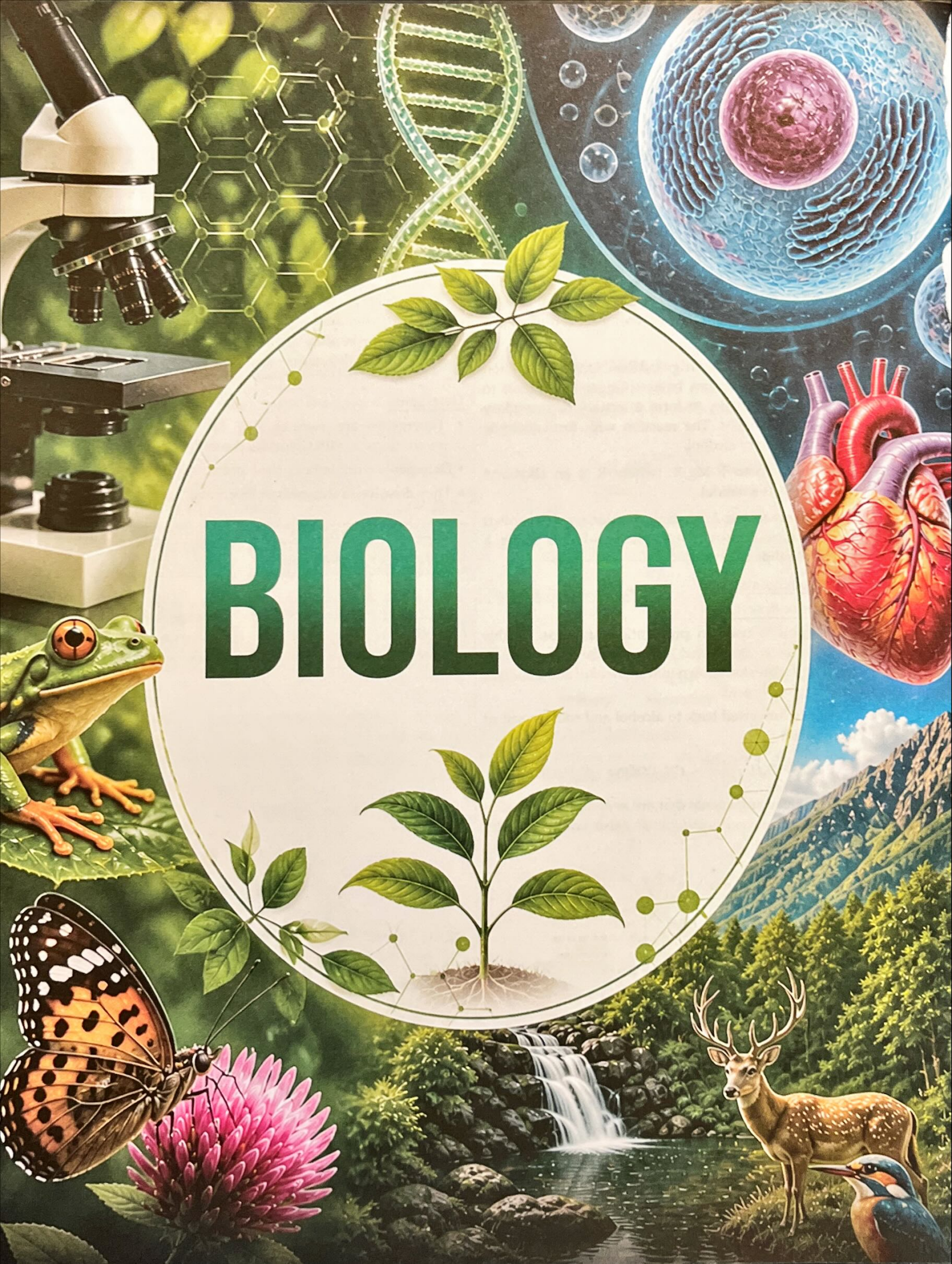
• Detergents are *sodium salt of sulphonic acids* or *ammonium salts* with Chloride, Bromide ions etc.

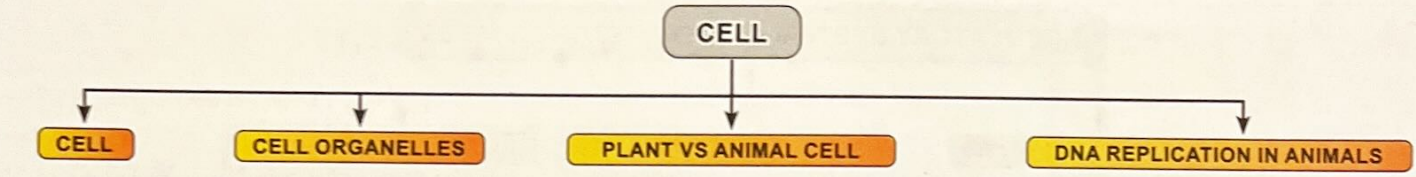
• Detergents work in both *hard* and *soft* water.

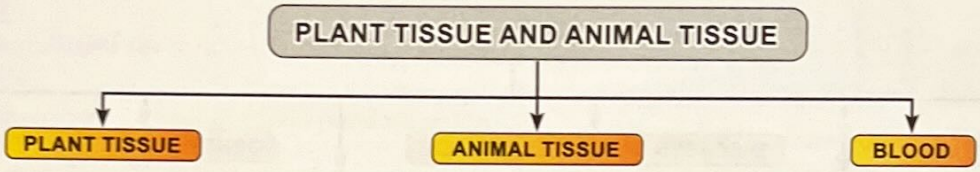
• They dissolve in water faster than soap.

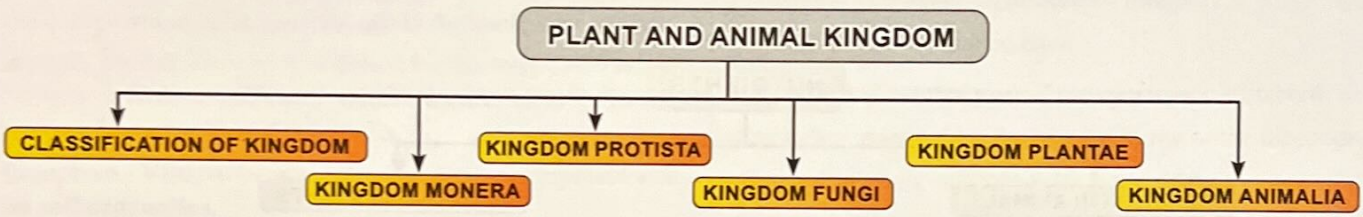
Sodium benzoate is used as a preservative in many foods, medicine, and cosmetics.

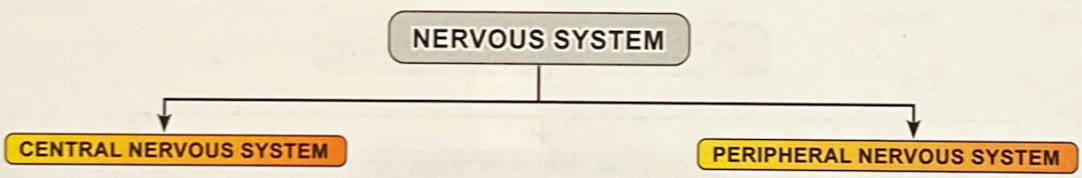
Friedrich Wohler in 1828 synthesised Urea (NH_2CONH_2), an Organic Compound from an Inorganic Compound named Ammonium Cyanate (NH_4CNO).

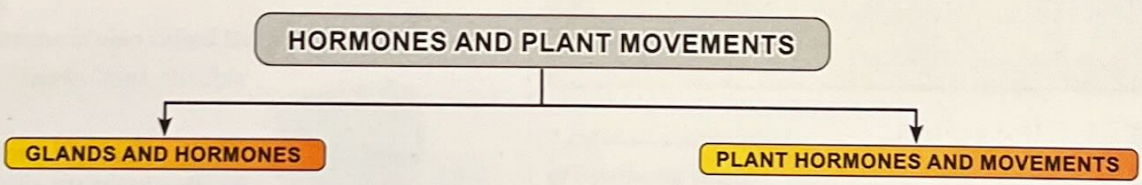

BIOLOGY

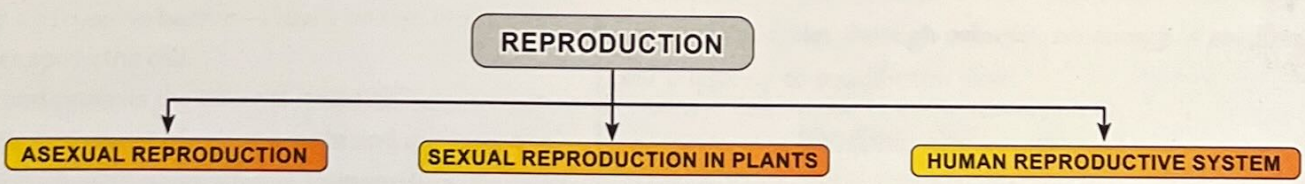

CELL
CELL
CELL ORGANELLES
PLANT VS ANIMAL CELL
DNA REPLICATION IN ANIMALS

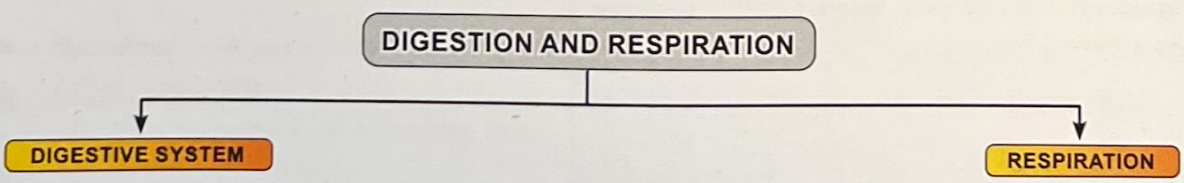

PLANT TISSUE AND ANIMAL TISSUE
PLANT TISSUE
ANIMAL TISSUE
BLOOD

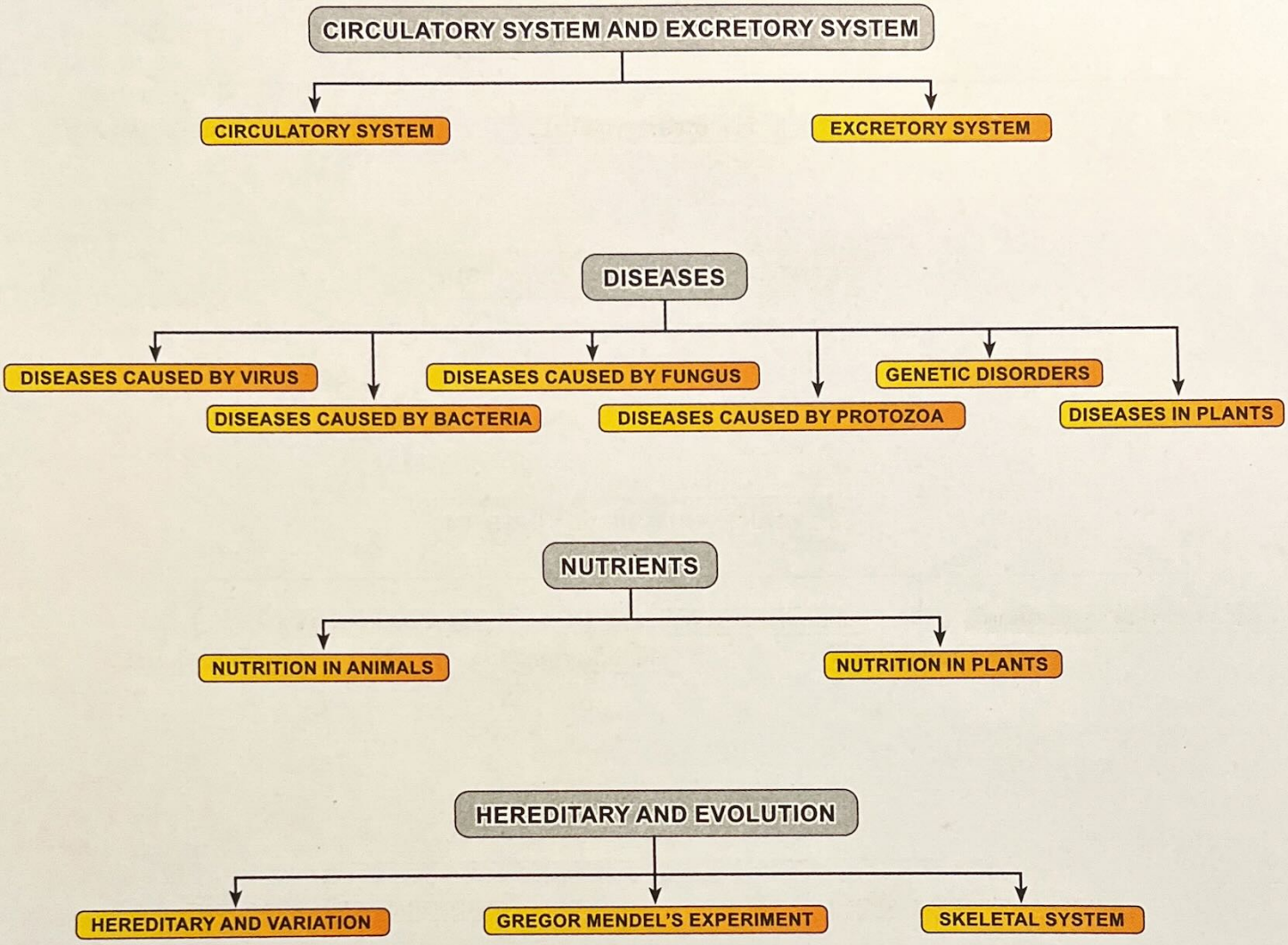

PLANT AND ANIMAL KINGDOM
CLASSIFICATION OF KINGDOM
KINGDOM MONERA
KINGDOM PROTISTA
KINGDOM FUNGI
KINGDOM PLANTAE
KINGDOM ANIMALIA


NERVOUS SYSTEM
CENTRAL NERVOUS SYSTEM
PERIPHERAL NERVOUS SYSTEM


HORMONES AND PLANT MOVEMENTS
GLANDS AND HORMONES
PLANT HORMONES AND MOVEMENTS


REPRODUCTION
ASEXUAL REPRODUCTION
SEXUAL REPRODUCTION IN PLANTS
HUMAN REPRODUCTIVE SYSTEM


DIGESTION AND RESPIRATION
DIGESTIVE SYSTEM
RESPIRATION


CIRCULATORY SYSTEM AND EXCRETORY SYSTEM
CIRCULATORY SYSTEM
EXCRETORY SYSTEM
DISEASES
DISEASES CAUSED BY VIRUS
DISEASES CAUSED BY BACTERIA
DISEASES CAUSED BY FUNGUS
DISEASES CAUSED BY PROTOZOA
GENETIC DISORDERS
DISEASES IN PLANTS
NUTRIENTS
NUTRITION IN ANIMALS
NUTRITION IN PLANTS
HEREDITARY AND EVOLUTION
HEREDITARY AND VARIATION
GREGOR MENDEL'S EXPERIMENT
SKELETAL SYSTEM

CELL

• The study of cell is called *Cytology*.

→ *Cyto: Cell*
→ *Logy: Study*

Cell is:
- *Building blocks of life.*
- *Fundamental unit of life.*
- *Structural and functional basis of life.*

Discovery of Cell

• *Dead cell: Robert Hooke* (in cork) → *Father of Cytology (1665).*

• *Living cell: Antonie van Leeuwenhoek* (in pond water) in *1674.*

Cell Theory

In *1838, Matthias Schleiden* and *Theodor Schwann* formulated the cell theory, stating that all living organisms are composed of cells, and the cell is the basic unit of life.

In *1855, Rudolf Virchow* published his famous Cell Theory *"omnis cellula e cellula"*, which means new cells are formed from the pre-existing cells.

Exception - Viruses because they have no protoplasm and no cell organelles.

Key facts regarding Cell
- *Largest cell in human: Ovum (female sex cell).*
- *Smallest cell in human: Sperm (Male sex cell).*
- *Largest Cell in male: Neuron (also known as the longest cell).*
- *Smallest cell in women: RBC.*
- *Largest cell: Ostrich's egg.*
- *Smallest cell: Mycoplasma (bacteria).*

Parts of Cell

Cell Membrane

• The cell membrane is also called the *plasma membrane.*

• It is a thin, elastic, and flexible structure.

• It is the outermost covering of the cell in animal cells (in plant cells, it lies just beneath the cell wall)

Cell membrane

Functions:

• It acts as a protective barrier → like a *bodyguard.*

• It gives shape to the cell.

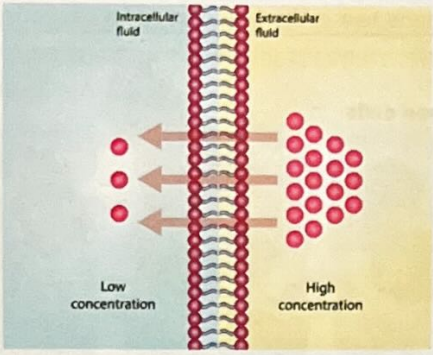
• It holds and protects the internal contents.

• It controls movement of substances in and out (acts as a *selectively permeable membrane*) → ***Composition:*** *Proteins (50%) +*
Lipids (50%).

Phospholipids *Cholesterol*

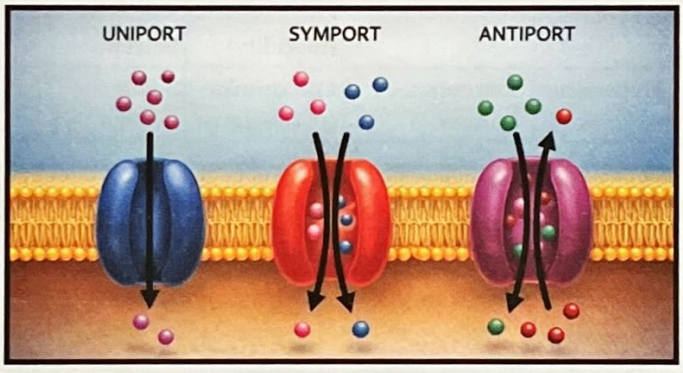
Movement across Cell Membrane

• ***Diffusion:*** Spontaneous movement of molecules from *higher to lower concentration.*



Three types of transmembrane transport mechanisms, usually involving facilitated diffusion or coupled active transport-

1. **Uniport (Passive/Facilitated)**-Transport a single type of solute across the membrane.
2. **Symport (Co-transport)**-Transports two different molecules or ions simultaneously in the same direction, often using one gradient to drive the other.
3. **Antiport (Counter-transport)**-Transports two different molecules or ions in opposite directions.



• ***Rate of Diffusion:*** *Gases > Liquids > Solids.* ***E.g. Diffusion of agarbatti smell.***

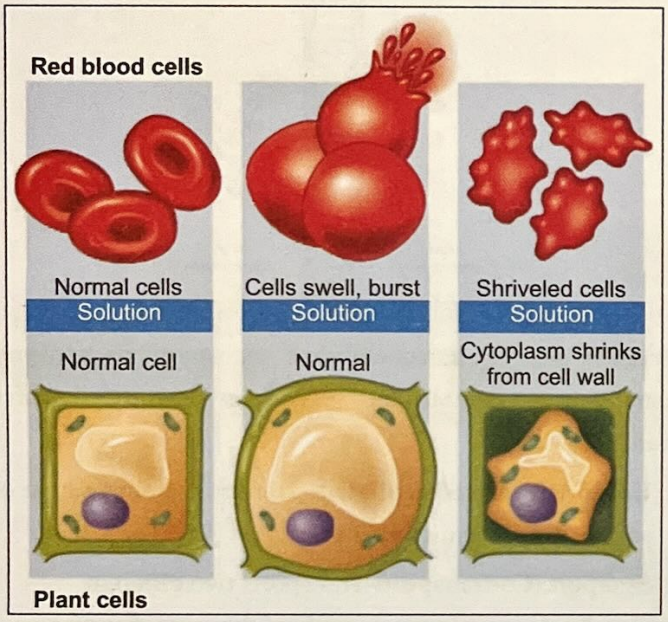
• ***Osmosis:*** Movement of water from *higher to lower concentration* but through a *semi-permeable membrane.* Cell absorbs water through osmosis, no energy is required and it lasts up to equilibrium state.

Solution = Solute + Solvent

Active Transport/Reverse Osmosis

• Movement of molecules *across a cell membrane* from a region of *lower to higher concentration.* It requires cellular energy.

What happens to a cell when placed in a solution?



Type	Description	Effect on Cell	Solute vs solvent
Isotonic	Normal solution	No change in cell size	Solute = Solvent
Hypotonic	Dilute solution	Cell swells (turgidity)	Solute < Solvent
Hypertonic	Concentrated solution	Cell shrinks (plasmolysis)	Solute > Solvent

***Turgor pressure causes enlargement and extensive growth of cells.*

Cell Wall

- It is only present in *plant/bacteria/fungus/algae*.
- The cell wall is *not a living structure*.
- The cell wall allows the free passage of molecules, unlike the selectively permeable cell membrane.

- It provides rigidity and shape to the cell.
- It offers structural support and protection to the cell.

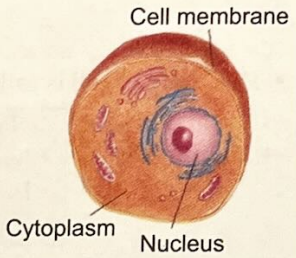
Materials of Cell Wall:

- ***Bacteria:*** *Peptin/Peptidoglycan.*
- ***Fungi:*** *Chitin.*
- ***Plant:*** *Cellulose.*
- ***Algae:*** *Cellulose/Pectin.*

Glycocalyx: *A surface layer (slime layer) that covers the cell membrane in bacteria.*

Cytoplasm

- Cytoplasm is the fluid that fills up the cells. It is the part that is located between the plasma membrane and nuclear envelope.
- Cell organelles are present in cytoplasm.
- ***Cytosol:*** The aqueous (water-based) fluid portion of the cytoplasm.
- ***Cytoplasmic Inclusions:*** Non-living components (pigments, nutrients, etc.) of cytoplasm.



Cytoplasmic Content Activities

Nucleus

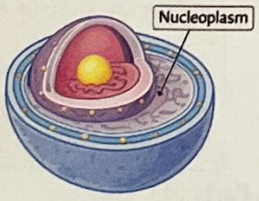
- Nucleus is known as *"Brain of the Cell"*, it controls the activities of different cell organelles.
- ***Discovered by:*** *Robert Brown in 1831.*
- The nucleus is found in the center of the cell.
- The nucleus is the *largest organelle* (double-membraned) in a eukaryotic cell.

The protoplasm is the living material of the cell and composed of biomolecules like nucleic acids, proteins, lipids, and carbohydrates.

- The nucleus is enclosed by a double-layered nuclear membrane, which separates the nucleus from the cytoplasm.
- It permits materials between nucleoplasm and cytoplasm.

Nucleoplasm

- Nucleoplasm is a type of protoplasm (the term coined by *Purkinje* in *1839*) that is composed of thick fluid and constitutes chromatin fibres made up of DNA and usually found in the nucleus of the eukaryotic cells.



It exists in two forms: Euchromatin and Heterochromatin.

1. ***Euchromatin:*** Loosely packed, transcriptionally active.
2. ***Heterochromatin:*** Tightly packed, transcriptionally inactive.

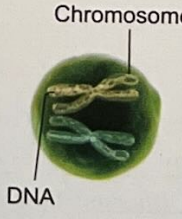
During cell division, chromatin condenses to form chromosomes.

Contents of Nucleoplasm:

1. ***Nucleolus:*** The nucleolus is a distinct, *non-membrane-bound* structure within the nucleus of eukaryotic cells, primarily known for its role in *ribosome biogenesis*.
2. ***Chromatin material:*** Chromatin is the complex of *DNA* and *proteins*, primarily histones, that makes up the genetic material of the cell.

Chromosomes

- Chromosomes are *thread-like structures* in the nucleus of cells that contain DNA and genes.
- They carry genetic information from cell to cell.
- Components of Chromosomes: *DNA and Proteins* (Histones).

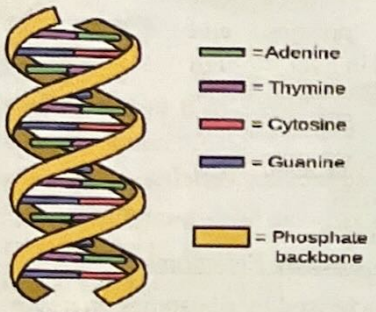


- *Total:* 46 Chromosomes (23 pairs) in a human being.
  - 22 pairs (autosomal).
  - 1 pair (sex pair): XX (female) and XY (male).

DNA

- DNA carries *genetic information*, and genes, which are functional segments of DNA, are responsible for transmitting this information from one generation to the next.
- DNA molecule is discovered by *Friedrich Miescher in 1869*.
- Double-helical structure of DNA is discovered by *Watson and Crick in 1953*.

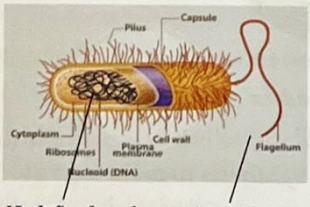
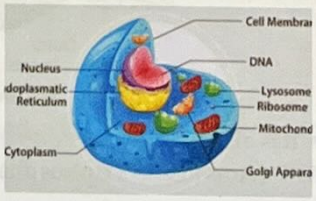
Components & Structure:



DNA

- DNA was identified as the genetic material by Oswald Avery, Colin MacLeod, and Maclyn McCarty in 1944.
- They worked on Streptococcus pneumonia and proved that the ' transforming principle' was DNA.
- Hershey and Chase in 1952 confirmed that DNA, not protein, is the genetic material that viruses inject into host cells.
- A phosphodiester bond is a strong, covalent linkage that forms the sugar-phosphate backbone of DNA and RNA, connecting the 3′ carbon atom of one sugar molecule to the 5′ carbon atom of another via a phosphate group.
- Human Genome Project, launched in 1990, completed in 2003 had the goal of determining the sequence of 3 billion base pairs that make up human DNA.
- ***Genome sequencing*** is a laboratory process that determines the complete DNA sequence (order of A, C, G, and T bases) of an organism's genome.
- Impact of human genome sequencing: It initiates a new scientific domain.
- The term 'complementary' in the context of DNA refers to hydrogen bonding potential based on base specificity. It also governs the process of transcription.
- Φ X174 phage is a bacteriophage with one of the smallest known DNA lengths (~ 5,386 nucleotides).
- The inability to isolate intact DNA for structural studies prior to the 1950s was primarily due to DNA's large polymeric nature and fragility.
- The phosphate group's ionizable oxygen atoms of the phosphodiester bond contribute most to the overall negative charge of the DNA molecule.
- ***Gene editing*** is a precise technology-most notably CRISPR-Cas9 that acts as "molecular scissors" to add, remove, or alter DNA at specific locations in the genome. It enables targeted genetic modifications, accelerating research and therapeutic development for diseases like sickle cell, alongside agriculture innovations.
- ***CRISPR-Cas9*** was developed by ***Jennifer Doudna and Emmanuelle Charpentier in*** 2012.
- CRISPR- Clustered regularly interspaced short palindromic repeats.
- Genetically Modified Organisms (GMOs) are living organisms- plants, animals, or microorganisms- whose genetic material (DNA) has been altered using genetic engineering techniques in ways that do not occur naturally, such as through mating or natural recombination. E.g. Bt Cotton.

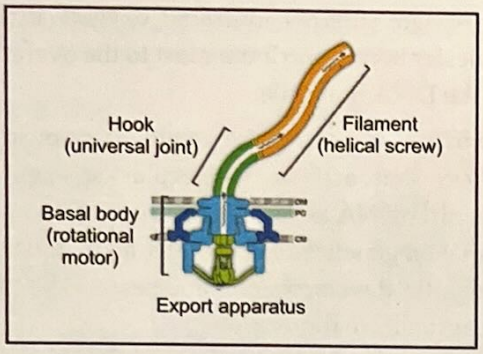
Types of cell

Prokaryotic Cell	*Eukaryotic Cell*
• Size: 1-10 µm • Nucleus absent • Nucleolus absent • Cell organelles absent • Chromosome: single • *E.g. Bacteria, Cyanobacteria (Blue green algae),mycoplasma*	• Size: 10-100 µm • Nucleus present • Nucleolus present • Cell organelles present • Chromosome: more than one • *E.g. Plant and animal cell*
	
Undefined nuclear region: Nucleoid *Appendages*	

Common things in both are: Ribosomes, Cytoplasm, Cell membrane

Bacterial Flagellum

- Flagella are microscopic *hair-like structures* involved in the locomotion of a cell.
- The flagellum is a helical structure composed of *flagellin protein*.
- The flagella structure is divided into three parts: *Basal body, Hook and Filament*.



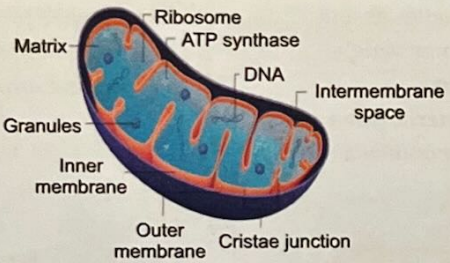
- ***Basal Body:*** It is attached to the cell membrane and cytoplasmic membrane.
- ***Hook:*** It is a broader area present at the base of the filament.
- ***Filament:*** Thin hair-like structure arising from the hook.

CELL ORGANELLES

- Cell organelles are specialized, *membrane-bound structures* within cells that perform specific functions essential for cell survival and function, much like organs in the body.

Mitochondria

- ***Length:*** 1-2 μm (1 micro metre: 10^{-6} m).
- ***Diameter:*** 0.1-0.6 μm.
- Mitochondria is involved in apoptosis (programmed cell death).
- Also known as weird organelles and cell within a cell.
- Discovered by: *Albert Von Kolliker* in *1857*.



Mitochondria

- It is also known as *"Powerhouse of the cell"* responsible for *ATP* (Adenosine Triphosphate) synthesis to make energy.
- ATP is also called as energy currency of the cell.
- ***Two membranes:*** Outer membrane (porous in nature) and Inner membrane (responsible for ATP synthesis).
- Mitochondria has its *own DNA and ribosomes*.
- Shape is like a **"sausage"**.
- The number of mitochondria in a cell varies depending on the physiological activity of the cell.
- ATP (Adenosine triphosphate) hydrolysis is the primary reaction that releases energy to power cellular work, acting as the "molecular unit of currency" for intracellular energy transfer.

$$ATP + H_2O \xrightarrow[\text{hydrolysis}]{\text{ATPase}} ADP + Pi \quad \Delta G = -30.5 \text{ kJ/mol}$$

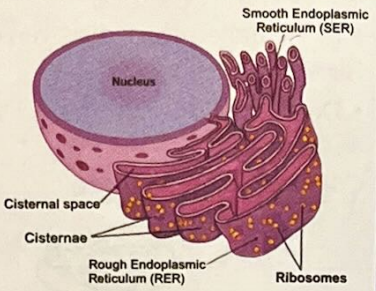
Ribosomes

- Ribosomes *do not* have a membrane.
- They are essential cell structures for protein synthesis.
- ***Discovered by:*** *George E. Palade (1955)*.

Ribosomes

Endoplasmic Reticulum

- They are network of *sac-like* structures.
- They are attached to plasma membrane on one side and outer nuclear membrane on the other.
- Endoplasmic Reticulum serves as transport between cytoplasm and nucleus.
- Detoxify poisons, and drugs (SER in liver through an enzyme *Cytochrome P450*).



Endoplasmic reticulum

- ***Types:*** *Long tubules, Vesicles, and Cisternae.*

Functions:

Rough Endoplasmic Reticulum

- It is characterized by ribosomes on its surface, which are responsible for *protein* synthesis.

Smooth Endoplasmic Reticulum

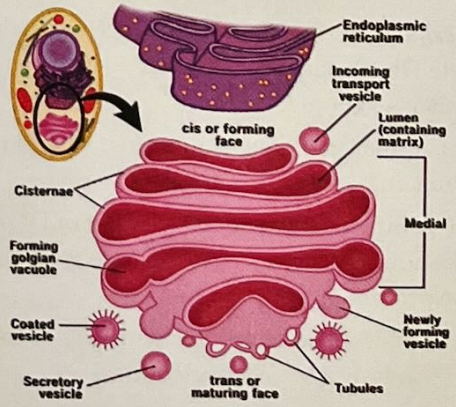
- It is characterized by the absence of ribosomes and plays a crucial role in synthesizing *lipids and fats*.
- Ribosomes are *absent* here.

Golgi Bodies

- ***Discovered by:*** *Camillo Golgi (1898)*.
- It consists of *vesicles, cisternae, and vacuoles*.
- It is also involved in protein modification.
- ***Golgi bodies have two distinct faces:***

1. ***Cis face:*** Convex, faces towards the nucleus (receiving side).

2. ***Trans face:*** Concave, faces towards plasma membrane (mature/shipping side).



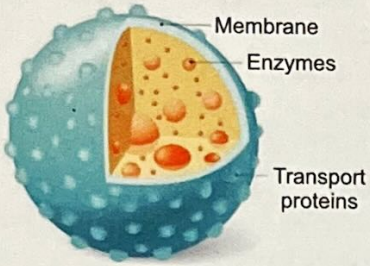
Golgi Body

Functions:

- It is responsible for *packaging* and *dispatching* of *proteins* and *lipids* (also known as *"Post Office"* of the cell).
- It is involved in forming complex sugar from simple sugars.
- It forms lysosomes.

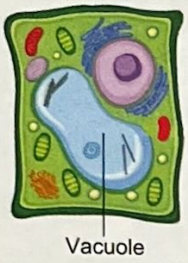
Lysosomes

- It is known as *"suicide bag of the cell"*.
- Lysosomes are filled with *digestive enzymes* (made in RER) that acts as *waste disposal system* of cell.



Lysosome

- When the cells get damaged, lysosomes may burst leading to enzymes *digesting their own cell.*



Vacuoles

- Vacuoles are membrane bound *solid* or *liquid* filled *sac-like* structures.
- Waste produced are temporarily stored in Vacuoles.

In plants:

- They are large and distinct and occupy significant portion of cell volume (*50-90%*).
- They store cell sap.
- They provide turgidity and rigidity to the cell.
- In plant cells, vacuoles are generally considered permanent, large, and central structures.

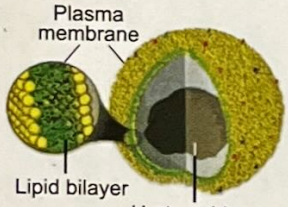
In animals:

- In animal cells, vacuoles are smaller, more numerous, and often *temporary*.
- They store *glucose, glycogen,* and *protein.*

Cell sap consists of:
- Amino acids
- Sugars
- Organic acids

Peroxisomes

- It breakdowns very long chain of fatty acid through beta oxidation.
- It contains *oxidative enzymes* (E.g. Catalase) that convert harmful *hydrogen peroxide* into water and *oxygen*. It acts as free radical scavengers, helping to detoxify the cell.

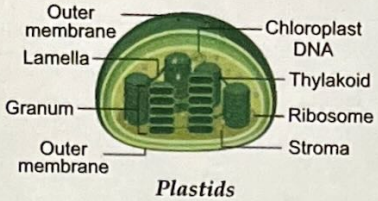


Peroxisomes

- Small round organelles that undergo oxidation reaction to produce hydrogen peroxide.

Plastids

- Plastids are only present in plant cell and not in animal cell.
- It has its own DNA and ribosomes.
- They are interchangeable.
- Anthocyanins are a type of flavonoid. They give red, purple, blue colors.
- Betalain nitrogen pigment-red-violet/yellow
- Lycopene and carotenoid- red.



Plastids

Types of Plastids:

1. Chloroplast

- Chloroplasts are green plastids that contain *chlorophyll*, the pigment responsible for photosynthesis.
- They also contain yellow and orange pigments like *Xanthophylls* and *Carotenes.*
- Chlorophyll molecules contain *magnesium* (Mg^{2+}), which is essential for capturing solar energy during food synthesis (photosynthesis).

2. Chromoplasts

- It contains different types of pigments, which provides colour.

E.g. Red colour in tomato which is due to lycopene, red colour in chilli which is due to capsanthin.

2. Leucoplasts

- Leucoplasts are *colourless plastids*, mainly involved in *storage.*

They are of three types:

- ***Amyloplast:*** Storage of *carbohydrates.*
- ***Aleuroplast:*** Storage of *proteins.*
- ***Elaioplast:*** Storage of *fats.*

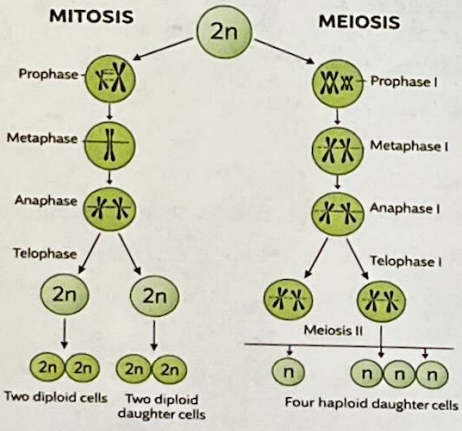
Cell Division

- Cell division is the process where a parent cell divides into *two or more daughter cells.*

Reason for division:

- Growth of organism.
- To replace old, dead, and injured cell.
- Gamete formation (Meiosis).

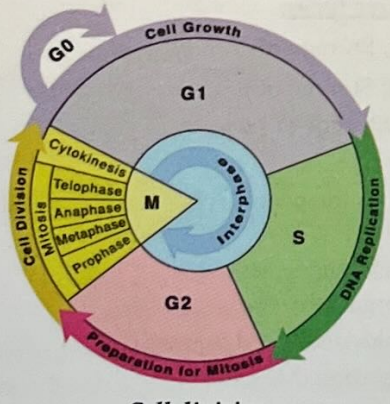
Mitosis and Meiosis



Mitosis	Meiosis
Occurs in somatic cells (body cells)	Occurs in germ cells (reproductive cells)
The nucleus divides only once	The nucleus divides twice
Produces two daughter cells	Produces four daughter cells
Daughter cells are diploid ($2n$) → same no. of chromosomes as the parent cells	Daughter cells are haploid (n) → half the no. of chromosomes as the parent cells
Cells are genetically identical to each other and to the parent cell	Cells are genetically different from each other and from the parent cell
Responsible for growth, repair, and asexual reproduction	Responsible for formation of gametes (egg and sperm cells)
No genetic variation occurs	Genetic variation occurs due to crossing over and independent assortment
Malfunction can lead to cancer (uncontrolled cell division)	Malfunction can lead to genetic disorders such as: Down's syndrome, *Klinefelter's syndrome, Turner's syndrome*

Cell Cycle

- ***G1 Phase (Gap 1):*** The *cell grows* and performs its normal functions, preparing for DNA replication.
- ***S Phase (Synthesis):*** The *cell replicates its DNA*, creating two identical copies of each chromosome.

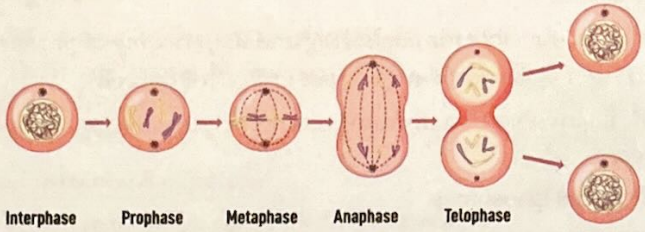


Cell division

- ***G2 Phase (Gap 2):*** The cell continues to grow and *prepares for mitosis*, ensuring that DNA replication is complete and that the cell is ready to divide.
- ***Mitotic Phase:*** This phase involves the *division of the cell's nucleus* and *cytoplasm*.

Types of mitosis:

- ***Prophase:*** Chromosomes condense and become visible.
- ***Metaphase:*** Chromosomes align at the cell's equator.
- ***Anaphase:*** Sister chromatids separate and move to opposite poles.
- ***Telophase:*** Two new nuclei are formed.

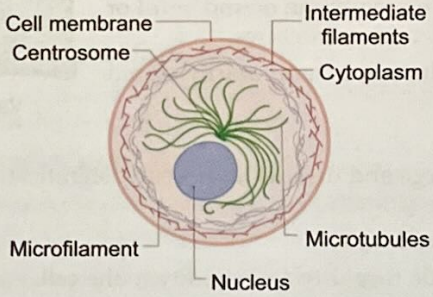


About stem cells:

- Stem cells have the potential for self-renewal via mitotic cell division.
- In 1998, James Thomson and his colleague first derived human embryonic stem cells from donated blastocysts through in vitro fertilization.

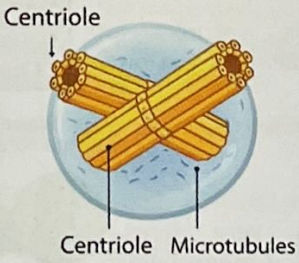
Cytoskeleton

- Cytoskeleton helps in providing structural support to cell.
- Cytoskeleton helps in *cell movement.*



Cytoskeleton

Centrosome



- Centrosome is also known as the Microtubule Organizing Center (MTOC) because it regulates cell division and structure.
- The centrosome is responsible for organizing microtubules, which are essential for cell structure, movement, and division.
- Each centriole is a cylindrical structure made up of microtubule arranged in *9+0 form*.

RNA

- It is a single-stranded nucleic acid essential for protein synthesis and gene regulation in all living cells, acting as a messenger, adaptor, or structural component.

• Composed of ribose sugar, a phosphate group, and bases- adenine (A), cytosine (C), guanine (G), and uracil (U).

• **Primary function-** RNA converts genetic information from DNA into functional proteins via translation, bridging the gap between genetic code and cell function.

• In plant cells, RNA is present in- nuclei, cytoplasm, mitochondria, chloroplast and endoplasmic reticulum.

• **Main Types-**

–Messenger RNA (mRNA) :

Copies DNA instructions and carries them to ribosomes.

–Transfer RNA (tRNA):

Delivers specific amino acids to the ribosomes for protein assembly.

–Ribosomal RNA (rRNA):

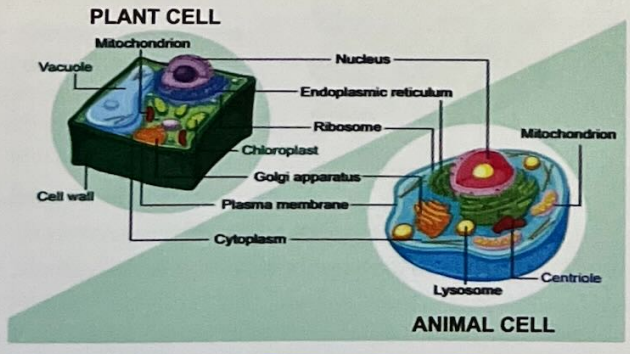
A structural component of ribosomes that enables protein synthesis.

Microtubules

• Microtubules are hollow, cylindrical structures composed of tubulin proteins that form part of the cell's cytoskeleton, providing structural support, facilitating cell movement, and playing a crucial role in cell division.

PLANT V.S ANIMAL CELL

Plant Cell	*Animal Cell*
Cell wall is present	Cell wall is absent
Chloroplast is present for photosynthesis	Chloroplast is absent
Almost rectangular in shape	Small, irregular, or round in shape
Large vacuoles are present	Small vacuoles are present
Plastids are present	Plastids are absent
Has less number of mitochondria	Has more number of mitochondria
Reserve food material is starch	Reserve food material is glycogen



DNA REPLICATION IN ANIMALS

DNA replication is a process by which cell makes an exact copy of its DNA before cell division. This ensures that each new cell gets the same genetic information.

• ***Mutation:*** A mutation is a permanent, random alteration in the DNA sequence of an organism or virus, altering the genetic instructions.

• ***Transcription:*** Transcription is the first step of gene expression, where a specific segment of DNA is copied into a new, single-stranded RNA molecule (mRNA) by the enzyme RNA polymerase.

Essential enzymes for DNA Replication in Animal Cell

• *Helicase:* This is an unwinding enzyme. It *"unwinds"* or *"unzips"* the double-stranded DNA.

• *Topoisomerase:* This enzyme prevents DNA from getting tangled (avoid supercoiling).

• *DNA Primase:* This enzyme initiates DNA replication (new strands are produced).

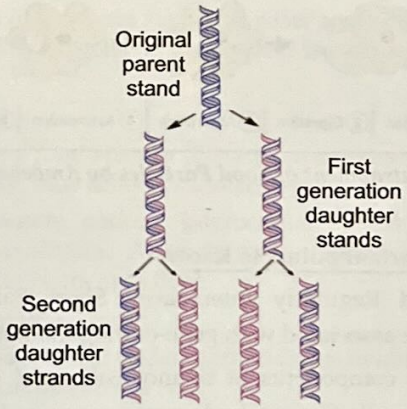
• *DNA Polymerase:* This enzyme doubles the amount of DNA in a cell during cell division (builder).

• *DNA Ligase:* This enzyme facilitates the joining of DNA strand together (gluer).

Reverse Transcriptase: The process of creating complementary strands of DNA based on RNA.

Semi Conservative DNA Replication

• It is the process of duplicating DNA to create *two new double stranded DNA molecules*, each with one *original strand*, and one *new strand*.



Semi-Conservative DNA Replication Model

Endocytosis and Exocytosis

Endocytosis

• Endocytosis is a type of active transport where a *cell engulfs external materials*, forming a vesicle to bring them inside.

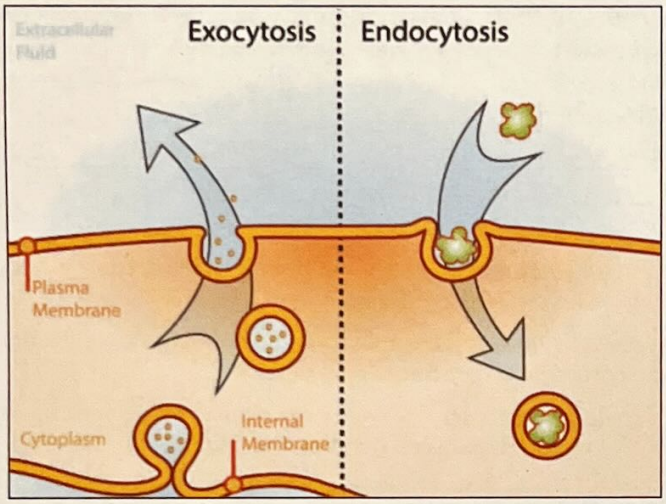
• It includes processes like *phagocytosis* (cell eating) and *pinocytosis* (cell drinking).

E.g. Entrapment of food particles by Amoeba.

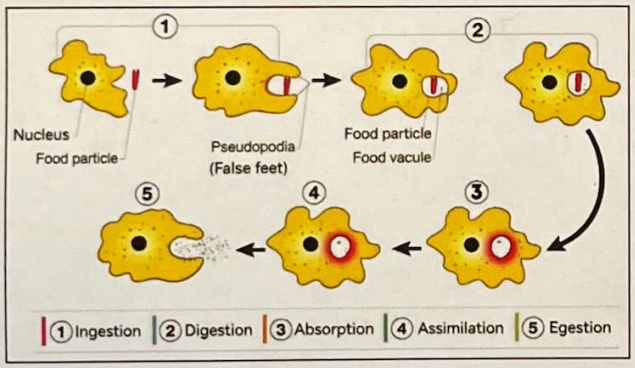
Exocytosis

• Exocytosis is a cellular process where a cell transports *molecules out of the cell* by using vesicles that fuse with the cell membrane, releasing their contents into the extracellular space.

• It is also known as *cell vomiting*. Vomited particles are undigested residues from endocytosis → *enzymes and hormones*.



Endocytosis and Exocytosis



Entrapment of Food Particles by Amoeba

Some important points to know

• Clustered Regularly Interspaced Short Palindromic Repeats are associated with gene-editing methods.

• Essential components of biomolecules and structural elements of cells-Carbon, hydrogen, oxygen and nitrogen.

• Microbodies found to be present in plant and animal cells contain ***enzymes***.

• Bacterial DNA is referred to as naked because it is not associated with proteins.

• In most prokaryotes, the chromosome number is 1.

• ***Plasmodesmata*** in plant cells forms cytoplasmic channels, allowing communication and transport between adjacent cells.

• Single-celled organisms do not need specific organs for taking in food, exchanging gases, or removing wastes because their entire surface is in contact with the environment.

• During the process of ***transcription*** in cells DNA is converted into RNA.

• The fluid portion of the cytosol, devoid of any cell organelles, present in both prokaryotic and eukaryotic cells is ***hyaloplasm***.

• Diploblastic animals have two germ layers: ectoderm and endoderm, separated by ***mesoglea***.

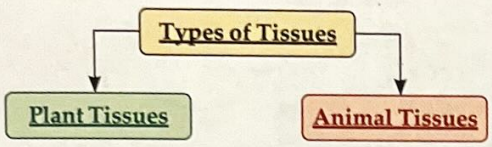
• Subsidiary cells support guard cells in stomatal function.

• When two nuclei fuse together forming one nucleus during cell fusion, it is known as ***Synkaryon***.

• The primary function of ***Aquaporins*** channel protein is to transport water across the cell membrane in response to the osmotic gradient created by active solute transport.

Tissue

• Tissue is a group of cells that work together to perform a specific function in the body.



Importance of Tissues

• It causes division of labour in multicellular organisms.

• It decreases workload on individual cells.

• The organization of tissues into organs and organ systems leads to improved body organization.

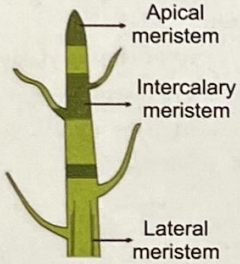
Basic unit of life → Cell
Group of cells → Tissue
Group of tissues → Organs
Group of organs → Organ System
Group of organ system → Organism

PLANT TISSUE

• Plant tissues are broadly classified into two types: *Meristematic Tissue* and *Permanent Tissue*.

Meristematic Tissue

• These tissues are made up of cells that can divide continuously, helping in plant growth.



Meristematic Tissue

Characteristics:

• ***Occurrence:*** Growing regions of plant (root, shoot, etc.).

• ***Shape:*** Spherical, oval, or rectangular.

• Cells are small and thin, with dense cytoplasm and large nuclei.

• *Intercellular spaces* and *vacuoles* are absent.

• They are active cells.

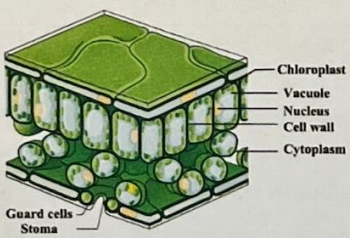
• Cell wall is made up of *cellulose*.

Protoderm is a part of apical meristem found in root and shoot and gives rise to epidermis.

Permanent Tissue

• These are *non-dividing cells* that have attained maturity and perform specific functions.

• Through the process of differentiation, meristematic tissues convert into permanent tissues.



Permanent Tissue

Characteristics:

• ***Occurrence:*** Roots, stem, leaves, etc.

• ***Shape:*** Round or oval or elongated, polygonal, or even irregular.

• Cell wall is thin or thick with large central vacuoles.

• ***Functions:*** Permanent tissues in plants perform a variety of essential functions, including support, storage, conduction, and protection.

Cambium: A layer of actively dividing meristematic tissue(lateral meristem) in woody plants, dicots and gymnosperms that facilitates secondary growth, increasing the stem and root diameter(girth), located between the xylem(wood) and phloem(bark).

Types of Meristematic Tissue

Type	Location	Function
Apical Meristem	Present at shoot apex and root apex	Increases length of root and shoot
Lateral Meristem	Beneath the bark	Increases thickness of root and stem
Intercalary Meristem	At the base of leaves or internodes (grasses)	Increase in length of leaves and internodes (*E.g. Leaf blades*)

Types of Permanent Tissue

1. ***Simple Permanent Tissue:*** These tissues are also known as *homogenous tissues*. They are made up of a single cell type, usually with the same origin, structure, and function.

Types:

(a) Parenchyma Tissue

• ***Occurrence:*** Throughout the plant body, particularly in soft parts like the cortex and pith of roots and stems, leaf mesophyll, and within vascular bundles.

• They are living cells.

• They have large lumen.

• ***The pith*** of the main stem and roots contains the spongy, soft parenchyma cells that carry and store nutrients for the plant.

Functions:

• It acts as a *food storage tissue*. In some cases, it contains chlorophyll , thus called *Chlorenchyma*.

• When loosely packed, intercellular spaces are present called *Aerenchyma*. Aerenchyma provides *buoyancy* to parts and helps them to float.

(b) Collenchyma Tissue

• ***Occurrence:*** In leaf stalks, stem of dicots epidermis and the vascular bundle of dicot leaf.

• Cells are living, elongated, irregularly *thickened at corners*.

• There is very little intracellular space between the cells.

• They have a narrow (moderate) lumen.

Functions:

• They act as *mechanical tissue* and thus provide mechanical strength to plants.

• They provide flexibility (allow bending of parts). ***E.g. Tendrils and stems of climbers.***

(c) Sclerenchyma

• *Occurrence:* In stems, around vascular bundles, in leaf veins, and in the hard coverings (*E.g. Bark, husk of coconut*).

• These are *dead tissues*, very hard and rigid in texture.

• They provide toughness to the tissue.

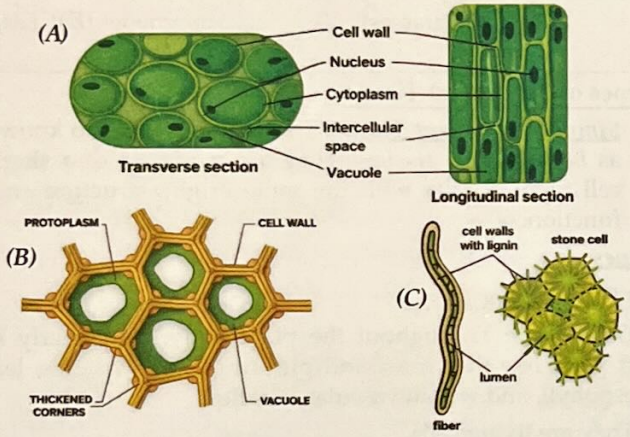
• They have absent lumen.

Functions:

• These provide mechanical support and rigidity to the plant.

• *Sclereids* are responsible for hardness of seeds and the shell of walnut.

• Lignified cell walls, which provide structural rigidity, strength, and water impermeability to plants, are primarily found in sclerenchyma cells (fibers and sclereids) and xylem tracheary elements (vessels and tracheids).



(A) Parenchyma Tissue; (B) Collenchyma Tissue
(C) Sclerenchyma Tissue

Protective Tissue (part of simple tissue)

• Protective tissues in plants are specialized tissues that form the outermost layers of the plant body, serving to shield it from various external factors like mechanical damage, pathogens, and water loss.

• In plants, protective tissues include the *epidermis* and *cork*.

(a) Epidermis

• The outermost layer of cells covering plant organs.

• *Occurrence:* Occurs in outermost layer of all the plant parts. *E.g. leaves, flowers , stem and roots.*

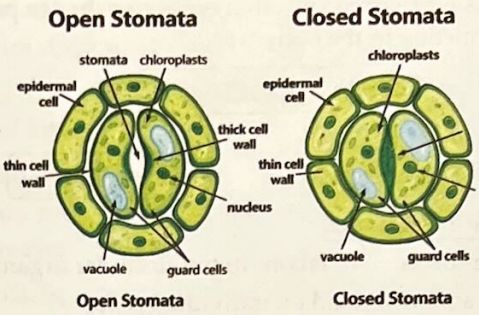
Functions:

• It protects all parts of plants.

• Plants of dry habitats have thicker epidermis.

• Plants growing in desert have *cuticle* (waxy coverings). Layer of cutin is called cuticle. Cutin is a waxy material and water resistant. It also aids in protection against water loss, injury and invasion of fungi.

• Epidermal cells of the roots forms hair like structure. Long hair like parts *increase absorption* on surface area of roots.



Opening and Closing of Stomata

• In leaves, epidermal cells form stomata that are guarded by *Guard cells*. Guard cells are kidney shaped structures that regulate *gaseous exchange* in plants.

• Subsidiary cells support stomatal function by providing mechanical assistance to open and close pores.

(b) Cork

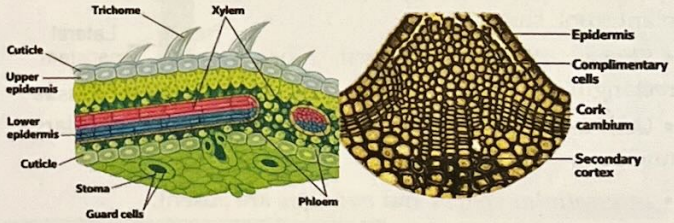
• Cork cells form the external protective tissue of plants. These cells are *dead* and *compactly arranged*, with their walls coated in *suberin*.

• *Occurrence:* Outer covering of stem and tree trunks.

Functions:

• It provides protection to mature roots and shoots.

• Suberin acts as a *protective barrier* for the plants. The suberin does not allow the water and gases to go outside of the cork cells.



Epidermis and Cork

Transpiration Vs Guttation

Transpiration	Guttation
Loss of water vapour	Loss of water droplets
Through stomata, cuticle and lenticels	Through hydathodes (Present on leaf sides)
Leads to loss of turgidity (wilting)	No effects on turgidity
Cools the plant body	No cooling of plant body
Happens at day time	Happens at night time

2. Complex Permanent Tissue: These tissues are made up of *various cell types* that work together as a unit to perform a specific function.

Types:

(a) *Xylem (Conducts water → One-way conduction)*

• It transports water and mineral nutrients from the roots to the leaves of the plant through transpiration pull (cohesion-tension mechanism).

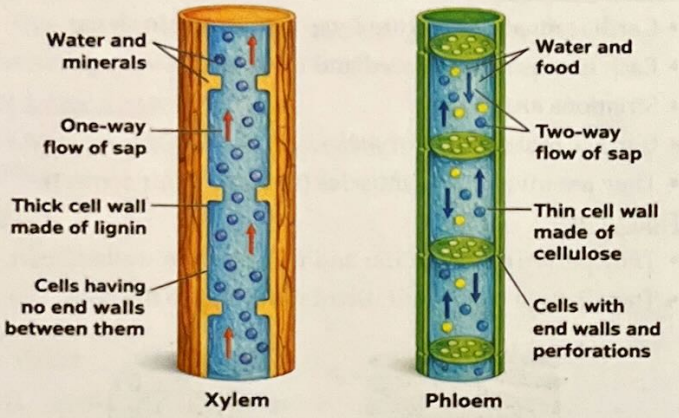
• It provides support to the plants.

• ***It is composed of:*** Tracheids, vessels, xylem fiber, and xylem parenchyma. *Only xylem parenchyma is a living tissue.*

(b) *Phloem (Conducts food → Two-way conduction)*

• It translocates the prepared food from the leaves to different parts of the plant.

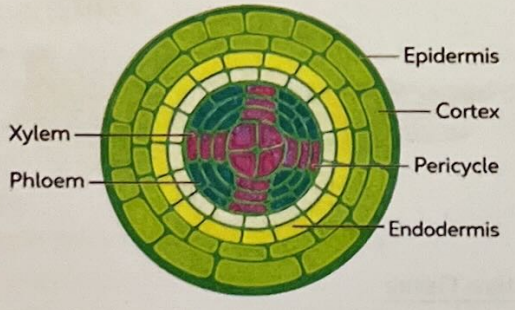
• ***It is composed of:*** Sieve tubes, companion cells, phloem parenchyma, and phloem fibre (provides rigidity and support). *Only phloem fibre is a dead tissue.*



Xylem and Phloem

Internal root structure

Dicot root



Some important points to know:

• **Heterophylly** is an example of plasticity in plants.

• The growth of a plant comprising its size, shape and orientation is known as **habit**.

• A glycocalyx that is a loose sheath type is called Slime layer.

• A vascular bundle where xylem and phloem are jointly situated along the same radius are called **conjoint vascular bundles**, and when arranged alternatively on different radii is called a **radial vascular bundle**.

• **Resins** and **gum** like waste products are stored in old xylem of plants.

ANIMAL TISSUE

• Animal tissues are groups of similar cells with specific functions working together to form body structures.

• Animal tissues can be broadly classified into four main types: *Epithelial, Muscular, Connective, and Nervous tissue.*

Epithelial Tissue

• ***Occurrence:*** Widespread throughout the body.

Characteristics:

• It acts as covering or protective tissue in animal body.

• Cells form continuous sheet and are tightly packed with no intercellular spaces.

• All epithelial tissues are separated by others through basement membrane.

• ***Function:*** It protects the body from injury or damage.

• There are two types of epithelial tissues: *Simple epithelial and Compound epithelial tissue.*

1. Simple Epithelial Tissue

• ***Occurrence:*** Lining for body cavities, ducts, and tubes.

• ***Structure:*** It is composed of a *single layer* of cells.

• Simple epithelial tissue is further divided into three types: *Squamous, Cuboidal, and Columnar.*

(a) Squamous Epithelial Tissue

• ***Occurrence:*** Lines blood vessels, air sacs of the lungs (alveoli), and body cavities like the peritoneum.

• ***Structure:*** Cells are extremely *thin* and *flat* with irregular shape.

Types of Squamous Epithelial Tissue

1. ***Simple Squamous Epithelial Tissue***

• ***Occurrence:*** Mouth and oesophagus (food pipe).

Characteristics:

• They are single layer of cells, *flattened with irregular* boundaries.

• They form *delicate lining*.

2. ***Stratified Squamous Epithelial Tissue***

• ***Occurrence:*** Skin.

Characteristics:

Specialised tissue for healing → Granulation Tissue.

• Cells are arranged in layers.

• Prevents *wear* and *tear*.

(b) Cuboidal Epithelial Tissue

• ***Occurrence:*** Salivary glands, sweat glands, thyroid glands, lining of kidney tubules.

• ***Structure:*** Cells have *cube-like structure* (height and width of the cells are equal).

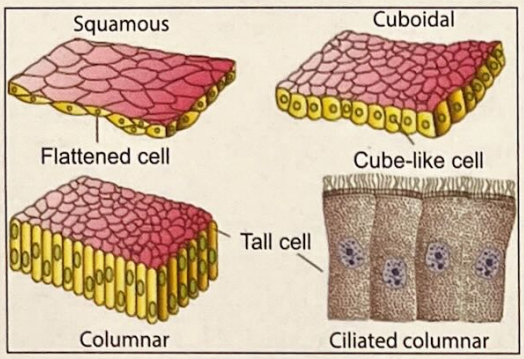
(c) Columnar Epithelial Tissue

• ***Occurrence:*** Lining of intestine, stomach and gallbladder.

• ***Structure:*** The cells are *pillar like, tall,* and *wide* in appearance. Their nuclei is located at the *base*.

Ciliated Epithelial Tissue

- *Occurrence:* Respiratory tract, urinary tubules or kidney.
- *Structure:* Cells are *cuboidal/columnar in shape* with *hair-like projections* on their free surface called *"cilia"*, which facilitates movement (particularly movement of fluids).
- *Function:* Movement of mucus, urine, etc. through rhythmic beating of cilia.



Types of Epithelial Tissues

Muscular Tissue

Structure:

- It is composed of muscle cells or muscle fibres.
- Muscle fibres are *elongated* and large in size. Contractile proteins are present in the *fibres* (important for movement of body).
- Muscle contraction occurs when a nerve signal (action potential) triggers the release of calcium ions in muscle fibers, allowing thick (myosin) and thin (actin) filaments to slide past each other. Many sarcomeres are arranged end to end to form a muscle fibre.
- *Function:* Contraction and relaxation, responsible for body movement.
- Muscular tissue is further divided into three types: *Skeletal muscle, Smooth muscle*, and *Cardiac muscle*.

1. Skeletal Muscle

- *Occurrence:* Skeletal part of the body (containing bones).

Characteristics:

- Muscle fibres are elongated, unbranched and cylindrical in shape.
- They are fast in nature.
- They are voluntary muscles.
- Each cell is *multinucleated* (many nuclei) with *striations* (alternate, dark and light bands).
- These cells are *easily fatigue*.
- *Function:* They help in body movement and maintaining posture.

2. Smooth Muscle

- *Occurrence:* In organs like intestine, uterus, blood vessels, stomach, bronchi and iris.

Characteristics:

- The nucleus is located at the centre of each cell.
- Cells are *non-striated, spindle shaped/fusiform* which are held together by cell junction.
- Cells are *unbranched*, slow in growth and *do not fatigue easily.*
- They are involuntary muscles (not under our control).
- *Function: Muscle peristalsis* (a wave-like movement that propels food and other substances through the digestive tract).

3. Cardiac Muscle

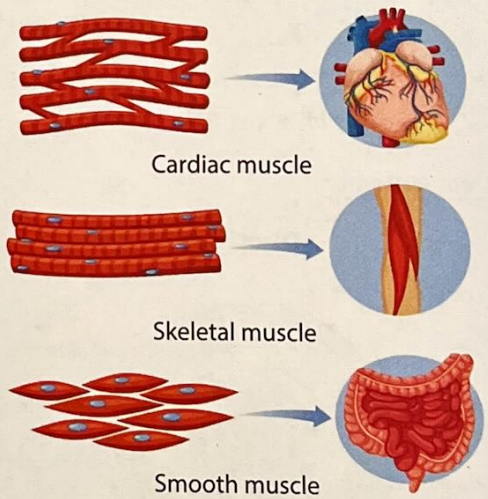
- *Occurrence:* Heart.

Characteristics:

- Cardiac muscle fibres are *long, cylindrical* in shape.
- Each fibre is *uninucleated* and *branched*.
- Striations are present.
- Cardiac muscles *do not fatigue*.
- They are involuntary muscles (not under our control).

Functions:

- They perform contraction and relaxation in wall of heart.
- They help to pump and distribute blood to the body.



Muscular Tissues

Connective Tissue

- *Occurrence:* Tendons, cartilage, adipose tissue, ligaments, dermis, etc.

Characteristics:

- It connects various body parts.
- The cells are embedded in *an extracellular matrix (ECM)*, this matrix may be jelly (cartilage), fluid (blood), dense or rigid (bone).
- It acts like a binding, supporting and packing material.
- It prevents organ from getting displaced by body movements.
- Connective tissue is further divided into two types: *Areolar connective tissue and Adipose connective tissue*.

1. **Areolar Connective Tissue**

Characteristics:

• It is a type of loose connective tissue that provides support, protection, and cushioning for various structures in the body.

• It is characterized by a loosely arranged network of fibers and cells within a *semi-fluid matrix*, making it flexible and adaptable.

• It is broadly divided into: *Loose connective tissue and Dense connective tissue*.

(a) **Loose Connective Tissue**

• ***Occurrence:*** Between skin and muscles, in space inside organs, in bone marrow.

• ***Structure:*** It is characterized by a loose, gel-like matrix consisting of cells, fibers, and a ground substance.

(b) **Dense Connective Tissue**

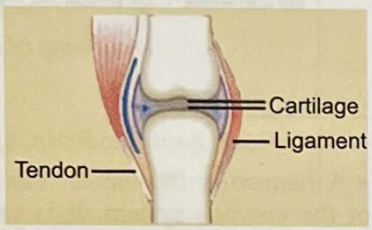
• ***Characteristics:*** It has a high proportion of fibers, primarily collagen.

Types:

1. **Tendons**

• It is a fibrous tissue with great strength and limited flexibility.

• It connects *Muscle to Bones*.



2. **Ligaments**

• It has considerable strength despite containing a small amount of matrix.

• It connects *Bones to Bones.*

2. **Adipose Connective Tissue**

• ***Occurrence:*** Below the skin (individuals with more body fat have more adipose tissue), in between internal organs.

• ***Structure:*** Cells are round, oval shaped. There is an aggregation of *fat cells* (adipocytes).

Functions:

• It prevents body from mechanical shock.

• It acts as an *insulator*.

E.g. Camel hump.

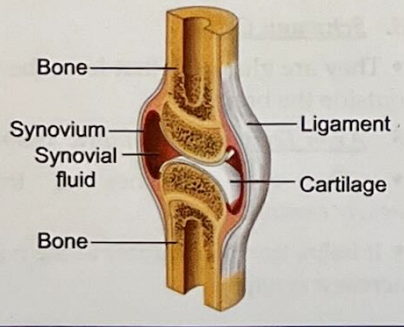
Skeletal Connective Tissue

• Skeletal connective tissues are connective tissues with unique structures and functions beyond basic support and connection.

• They are broadly classified as: *Cartilage and Bones*.

1. **Cartilage**

• ***Occurrence:*** Ear pinna, nose tip, trachea, larynx, bone surfaces at joints.



Characteristics:

• They are widely spaced out cells.

• *Matrix is gel-like* and slightly elastic.

• Cartilage is flexible in nature.

• ***Function:*** It supports and provides *flexibility* to body.

2. **Bones**

Characteristics:

• Bones are hard and rigid, strong, and non-flexible in nature.

• Matrix of the bone is hard and composed of *calcium* and *phosphorous* compounds.

Functions:

• It forms a network of framework that supports the body.

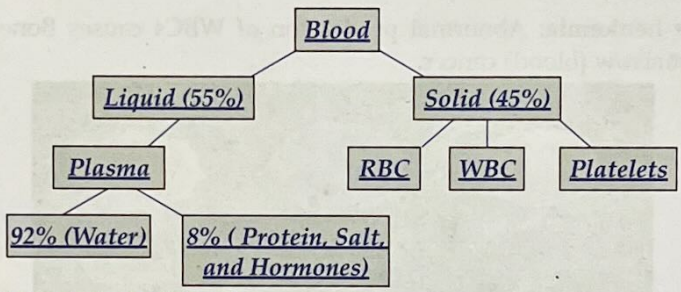
• It provides shape to body and protects the vital organs like brain, lungs, etc.

(c) **Fluid Connective Tissue**

• It connects different part of the body and maintains continuity.

• They are broadly classified as: *Blood and Lymph.*

1. **Blood**



Liquid Part of Blood

Plasma

• It is *yellow* in color.

• It consists of *92% water* and *8% proteins, salt and hormones*.

Proteins	Function
Fibrinogen/Heparin	Coagulants
Globulin	Provides defence
Albumin	To maintain osmotic balance

When clotting proteins are removed from blood, the clear liquid that remains after is called Serum.

Solid Part of Blood

RBC (Red Blood Cells)/Erythrocytes

• ***Normal range:*** *4.5 to 5.5 million per cubic millimeter.*

• ***Color:*** *Red* in color due to presence of *heme (Fe)*. Heme has high affinity towards oxygen.

• ***Shape:*** Biconcave; disc-shaped.

• ***Lifespan and Formation:*** Bone marrow (at birth) having a lifespan of - *about 120 days*.

- ***Function:*** It transports oxygen to whole body.
- Mature RBC's have no nucleus in them.
- Graveyard of RBC: *Spleen*.

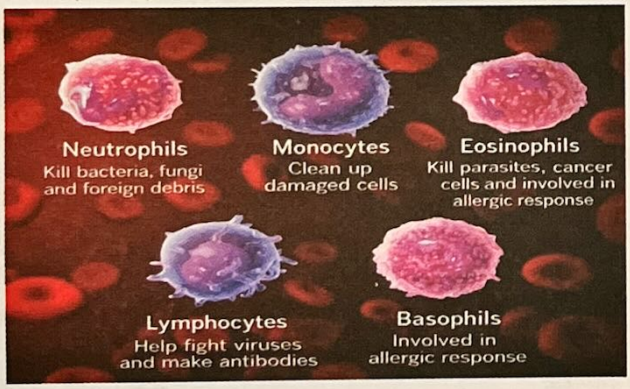
Study of Blood: Hematology

Hematopoiesis: It is the continuous, highly regulated process of producing new blood cells-red cells, white cells and platelets- from hematopoietic stem cells(HSCs) to replace old ones. This process occurs in bones like sternum, hip bones, vertebrae and ends of long bones where red bone marrow is present.

Polycythemia: A condition characterized by an abnormally high Red Blood Cell (RBC) count.

WBC (White Blood Cells)/Leukocytes

- ***Normal range:*** *5000-8000 per cubic millimeter.*
- WBC's protects our body from infection (provides our body a defence mechanism).
- ***Formed in:*** Bone marrow having life span of *13-20 days.*
- ***Shape:*** Round / Irregular in shape.
- ***Types:*** *Monocytes, Lymphocytes, Neutrophils, Basophils, Eosinophils.*
- **Leukemia:** Abnormal production of WBCs causes Bone marrow (blood) cancer.



Platelets/Thrombocytes

- ***Normal range:*** *1,50,000-3,50,000 per cubic millimeter.*
- ***Shape:*** Irregular shape.
- ***Formed in:*** Bone marrow having life span of *7-10 days.*
- ***Function:*** They are essential for preventing and *stopping bleeding* by forming *coagulation.*
- Low platelet count leads to *thrombocytopenia* (happens in case of dengue) and a very high platelet count leads to called *thrombocytosis.*

2. Lymph

Structure:

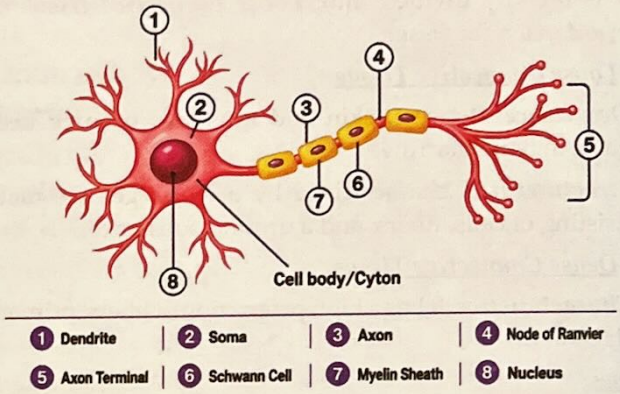
- It is *generally* colourless to pale yellow.
- RBC and blood proteins are *absent* in lymph.
- Lymph is similar to blood plasma → contains proteins, salt, glucose, and water.

Function:

- Lymph plays a crucial role in maintaining bodily fluid balance and supporting the immune system.

Nervous Tissue

- Neural tissue (or nervous tissue) is a specialized tissue found in the nervous system.
- It is responsible for receiving stimuli, transmitting signals, and coordinating responses throughout the body.



Anatomy of a Neuron

Anatomy of a Neuron

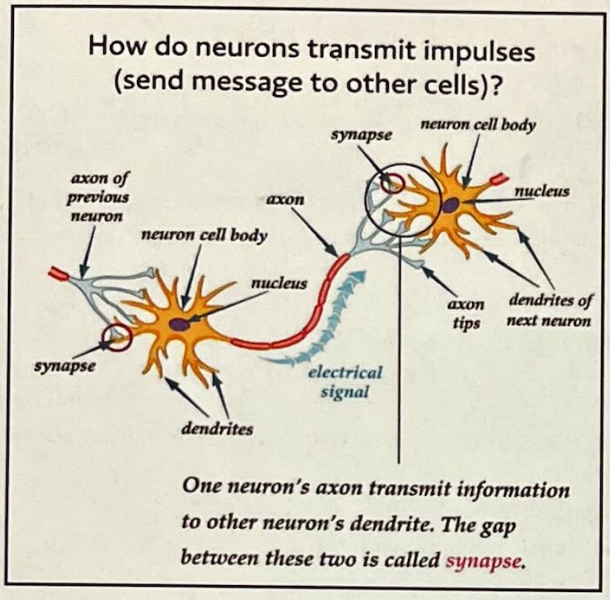
- ***Occurrence:*** Found in Brain, Spinal cord, Nerves.
- A neuron is the basic structural and fundamental unit of the nervous system. It is specialized to transmit nerve impulses.
- Neuron is the longest cell in the human body.
- **Protein forming centre-** Nissl Bodies.

Parts of Neurons:

1. ***Cell Body*** *(Soma)*
   - It contains the *nucleus* and *cytoplasm* and controls the activities of the neuron.
2. ***Dendrites***
   - Short, branched extensions from the cell body that receives signals from other neurons or sensory cells.
   - It carries *impulses toward the cell body.*
3. ***Axon***
   - It carries nerve impulses *away from the cell body* to other neurons or effectors (muscles / glands)
4. ***Myelin Sheath***
   - A fatty layer that covers the axon that insulates the axon and *speeds up signal transmission.*
5. ***Schwann Cells***
   - They are glial cells that form the *Myelin Sheath* on Axons outside the brain.
6. ***Axon Terminals*** *(Synaptic knobs)*
   - The end branches of the axon that contain *neurotransmitters.*
   - It helps transmit signals to the next neuron or effector cell across a synapse.

Transmission of Neuron Impulses

- A stimulus is received by the dendrites.
- An electrical impulse travels through the cell body and axon.
- At the axon terminals, the impulse triggers the release of neurotransmitters.
- Neurotransmitters cross the synapse and pass the signal to the next neuron or effector (like a muscle or gland).
- This leads to a response.



Camillo Golgi: First created the illustration of neuron using his silver-staining technique (Black Reaction).

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Some important facts to know:

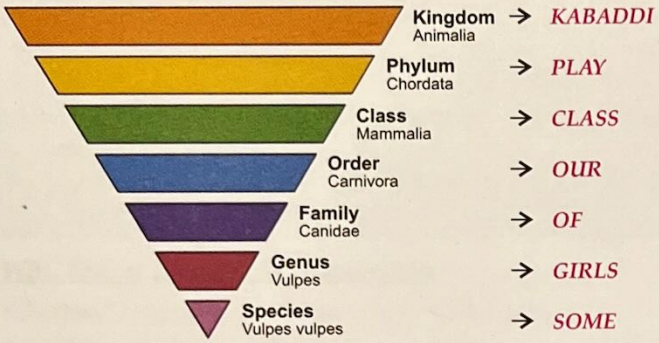
- **Iron and zinc** are essential for the production of red blood cells in the body.
- **IgM** immunoglobulin is the first to be produced in response to an infection.
- Dentin is the largest dental tissue.
- **Phagocytic cells** (phagocytes) are specialized white blood cells that protect the body by engulfing and digesting harmful microorganisms, foreign particles and cellular debris.

CLASSIFICATION OF KINGDOM

Taxonomy

• It is the science of describing, naming, and classifying organisms, including all plants, animals, and microorganisms.

Order of Classification



Classification

Two Kingdom Classification

Some Girls of Our Class Play Kabaddi.

• *Proposed by: Carolus Linnaeus (1758) → "Father of Taxonomy".*

• *Carolus Linnaeus- Also called the father of Modern Botany and Nomenclature.*
• *Cavalier Smith classified the organisms into 6 kingdoms.*

Kingdoms:

→ *Plantae:* Included all plants, algae, fungi.

Linnaeus published "System Nature" in 1735.

→ *Animalia:* Included all animals.

Three Kingdom Classification

• *Proposed by: Ernst Haeckel (1866)* → Coined the term *"Ecology"*.

Kingdoms:

→ *Plantae*

→ *Animalia*

→ *Protista:* New kingdom added for unicellular organisms *(Amoeba, Paramecium, Euglena).*

Three Domain Classification

• *Proposed by: Carl Woese (1990).*

Domains:

→ *Bacteria:* True prokaryotes *(E.g. E. coli).*

→ *Archaea:* Microorganisms with prokaryotic cells that are distinct from bacteria and are often found in extreme environments *(E.g. Halobacterium).*

→ *Eukarya:* All eukaryotic organisms *(Protists, Fungi, Plants, Animals).*

Five Kingdom Classification

• *Proposed by: R.H. Whittaker (1969).*

Kingdoms:

→ *Monera:* Prokaryotes *(bacteria, blue-green algae).*

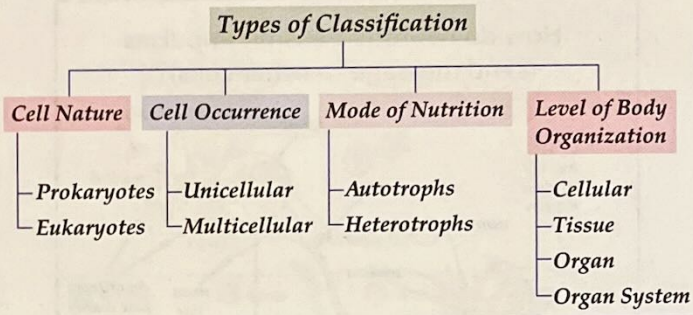
→ *Protista:* Eukaryotic unicellular organisms.

→ *Fungi:* Eukaryotic multicellular (some are unicellular) organisms, heterotrophic, spore-producing organisms.

→ *Plantae:* Autotrophic, multicellular.

→ *Animalia:* Heterotrophic, multicellular.

• *Basis of classification: Cell structure, mode of nutrition, body organization, reproduction.*



KINGDOM MONERA

• *Cell type:* Prokaryotic (no true nucleus or membrane-bound organelles).
• *Organization:* Unicellular, microscopic.
• *Cell Wall:* Made up of peptidoglycan (in bacteria).
• *Nutrition:* Autotrophic (photosynthetic or chemosynthetic) or heterotrophic (saprophytic or parasitic).

Classification of Kingdom Monera

Monera is mainly divided into two major groups:

1. *Eubacteria (True bacteria)*
• Most common and well-known group of bacteria.
• *Cell wall:* Contains *peptidoglycan.*
• *Nutrition:* Mostly heterotrophic (saprophytes, parasites), with some autotrophs (including photoautotrophs like cyanobacteria).

2. *Archaebacteria (Ancient bacteria)*
• They live in *extreme environments* (hot springs, salt lakes, swamps).
• *Cell wall:* Cell wall present but lacks peptidoglycan.

KINGDOM PROTISTA

• *Cell type: Eukaryotic* (has a true nucleus and organelles), cell wall is *absent.*
• *Organization:* Mostly unicellular, some are colonial or simple multicellular.
• *Locomotion:* Through appendages.
• *Nutrition:*

Habit: Growth form of a plant comprising its shape, size and orientation.
Habitat: Natural home or environment of a plant or animal.

→ *Autotrophic (photosynthesis):* Algae.
→ *Heterotrophic:* Protozoans (ingest food).

E.g.- Diatom, Kelp (Brown Algae).

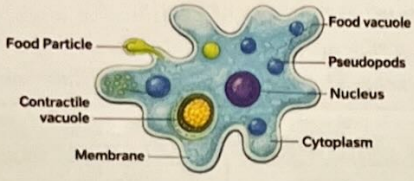
Classification of Kingdom Protista

1. *Phylum Protozoa*

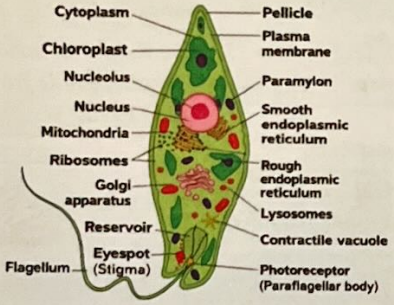
• ***Cell type:*** Unicellular.

• ***Mode of Nutrition:*** Heterotrophic (ingest food), parasitic or symbiotic.

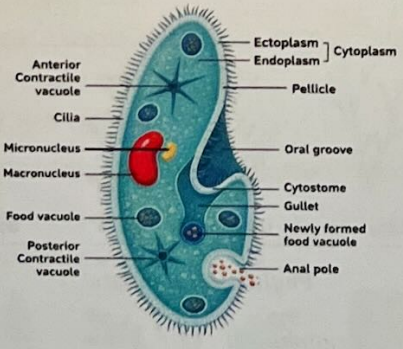
• ***Habitat:*** Mostly aquatic, solitary however few are colonial. ***E.g. Euglena (uses flagellum for movement), Amoeba (uses pseudopodia, a false-feet for movement), Paramecium (uses cilia for movement, that also helps to move food to its oral cavity), Plasmodium.***



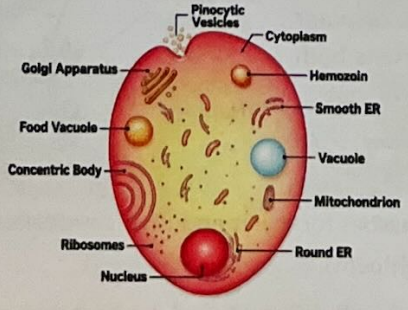
Amoeba



Euglena



Paramecium



Plasmodium

KINGDOM FUNGI

• ***Cell Type:*** *Eukaryotic* (has a true nucleus and membrane-bound organelles).

• ***Organization:*** Mostly multicellular, but some are unicellular ***(E.g. Yeast).***

• ***Cell Wall:*** Present and is made of *chitin* (not cellulose like in plants).

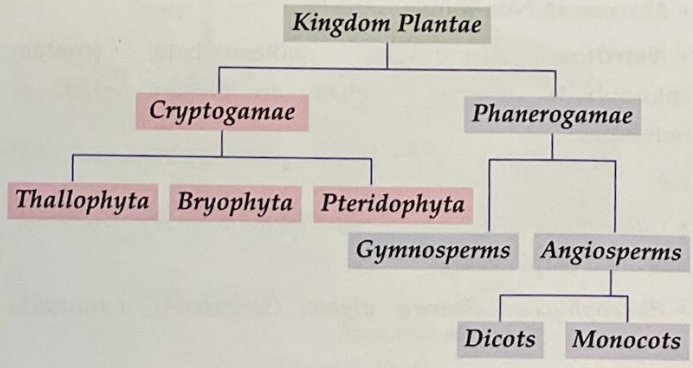
• ***Nutrition:*** Heterotrophic, typically *saprophytic* (feed on decaying organic matter), but some are *parasitic* (dependent on protoplasm of a host organism for food or *mutualistic* (both benefits from their association and sharing of resources).

• Some of them are in symbiotic relationship (benefit from each other). ***E.g. Lichen*** *(Blue-green algae + Fungi).* The fungus provides shelter, protection, and access to water and nutrients, while the blue-green algae (or green algae) produce food for the fungus through photosynthesis.

- *Study of Fungi- Mycology.*
- *Lichen is considered a natural indicator.*
- *Fungus on bread- Rhizopus.*
- *Mycorrhizae: Mutualism between fungi and roots of higher plants.*

Types of Fungi

KINGDOM PLANTAE



• ***Cell Type:*** Eukaryotic (has a true nucleus and membrane-bound organelles).

• ***Organization:*** Multicellular.

• ***Cell Wall:*** Made up of cellulose (provides structure and support).

• ***Nutrition:*** Autotrophic (producing their own food via photosynthesis using chlorophyll).

- *Botany: Botany is the scientific study of plants, including their structure, function, classification, and interactions with the environment.*
- *Theophrastus is known as the 'Father of Botany'.*

Kingdom Plantae is classified on the basis of:

- Differentiation of plant body and distinct components.
- Presence or absence of vascular tissues.
- Ability to bear seeds.
- Seeds are enclosed within the fruits.
- Ability to produce flowers.

Cryptogamae	*Phanerogamae*
Seeds, fruits, flowers are absent.	Seeds, fruits, flowers are present.
Reproductive organs are hidden.	Reproductive organs are exposed.
Less evolved plants	Highly evolved plants
E.g. Thallophytes, Bryophytes, and Pteridophytes	*E.g. Gymnosperms and Angiosperms*

Phylums of Kingdom Plantae

Phycology: Study of Algae

1. *Thallophyta (Algae)*

- ***Cell type:*** Eukaryotic.
- Simple, ***do not have well-differentiated body parts*** such as roots or stem (they have thallus).
- ***Non-vascular*** (no specialized tissue for transporting water and nutrients).
- ***Habitat:*** Mostly aquatic, mostly found in freshwater or marine environments. ***E.g. Spirogyra, Ulothrix, Ulva, Chara.***
- ***Movement:*** Non-motile.
- ***Nutrition:*** Autotrophic, photosynthetic (contain chlorophyll). Different pigments are present (edible or non-edible).

E.g.

- ***Chlorophyceae (Green algae):*** Chlorella (rich in proteins), Spirulina (superfood).
- ***Phaeophyceae (Brown algae):*** Sargassum, Laminaria (Kelp).
- ***Rhodophyceae (Red algae):*** Gelidium, Porphyra, Gracilaria, Polysiphonia.
- **Common green algae partners:**

—Trebouxia: The most common photobiont, found in diverse, often dry habitats.

Trentepohlia: Often found in orange-coloured lichens, characterized by filamentous growth.

Myrmecia and Dictyochloropsis: Frequently identified green algal partners.

Asterochloris: A common partner in certain lichen groups.

- **Common cyanobacteria partners:**

-Nostoc: The most common nitrogen fixing cyanobacteria partner.

-Scytonema: Another common cyanobacterial partner.

-Stigonema

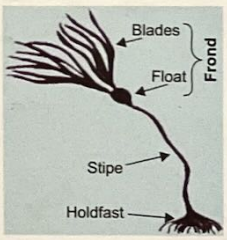
Algae
- *Cell wall*
- *The outer layer is made up of Cellulose.*
- *The inner layer is made up of Pectin.*
- *Chlorophyceae- stores food as starch.*
- *Phaeophyceae- stores food as mannitol/laminarin.*

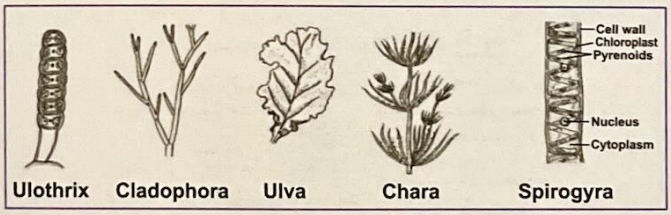
TRICK TO REMEMBER
(Chlorophyceae)
- *S: Spirogyra*
- *U: Ulothrix* — SUVCC
- *V: Volvox*
- *C: Chara*
- *C: Cladophora*

TRICK TO REMEMBER
(Phaeophyceae)
- *S: Sargassum* — SELF
- *E: Ectocarpus*
- *L: Laminaria (also known as Kelp. Mannitol is a sweet alcohol made from Kelp).*
- *F: Fucus*

Kelp (mannitol is a sweet alcohol Frond made from Kelp).

- *Agar a jelly like substance, is obtained from Rhodophyceae (red algae).*

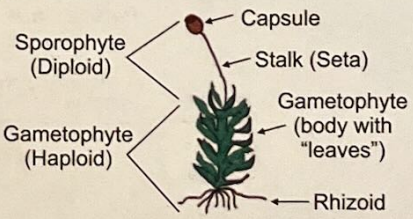




Phylum Thallophyta

2. *Bryophyta (Bryophytes)*

- They are known as ***"Amphibians of plant kingdom"*** (exists both in land and water).



- ***Non-vascular plants*** → no specialised tissues for water and food conduction (lack xylem and phloem).
- They have well-differentiated body however lack true

roots, stems and leaves. Roots like structure present in bryophytes are called ***Rhizoids***.

- ***Nutrition:*** Autotrophic.
- ***Movement:*** Non-motile.
- ***Reproduction:*** Through spores (no seeds) in water. (Haploid)

→ ***Male reproductive part: Antheridium.***

→ ***Female reproductive part: Archegonium.***

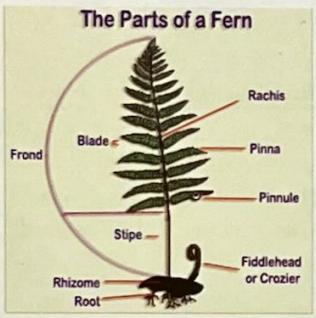
- ***Habitat:*** Found in damp and moist areas.

E.g.

- ***Mosses:*** Funaria.
- ***Liverworts:*** Marchantia, Riccia.

Phyllum Bryophyta

3. Pteridophyta



- They are considered as ***first terrestrial vascular plants*** (have xylem and phloem).
- Well-differentiated roots, stems, and leaves (called fronds in ferns). Leaves are made of leaflets that bear spores called ***Sporophylls***.
- They have ***hidden*** reproductive organs ***(cryptogams)***.
- ***Habitat:*** Found in cracks of rocks, moist, and shady places.

E.g. Marsilea, Ferns, and Horsetails.

Dryopteris

Selaginella

Equisetum

Adiantum

Pteris

Types of Pteridophytes

Gymnosperms {Meaning: Gymno (without cover) and Sperma (seeds without fruits)}

Pines Deodar Cycas

Gymnosperms

- ***Vascular plants***, have true roots, stem and leaves (with xylem and Gymnosperms, and Cotyledon phloem).
- Phloem Companion and Xylem Vessel are ***absent***.
- Seed-producing plants, but seeds are ***naked*** (not enclosed in fruit). The seeds are primitive and simple.
- They are usually perennials, evergreen, and mostly woody plants. ***E.g. Pines, Deodar, Cycas.***

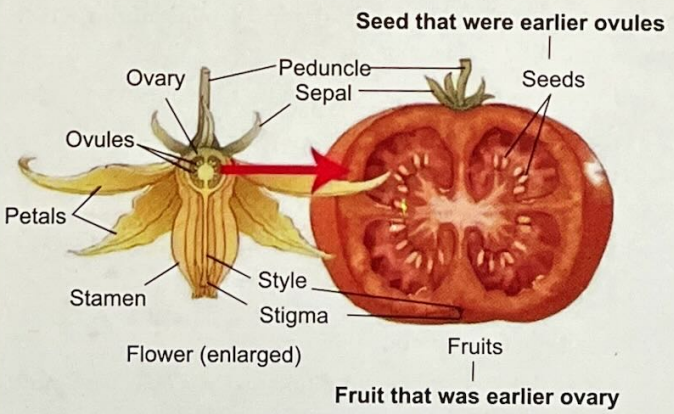
Angiosperms {Meaning: Angio (covered) and Sperma (seeds)}

- They are ***flowering plants*** and produce ***seeds enclosed within fruit*** (ovary gets modified into fruit).
- ***Vascular plants*** with xylem and phloem. They are highly evolved.
- Flowers are the ***reproductive organs***.
- Seeds have ***embryo*** inside it and embryos have structure called ***cotyledons*** (seed leaves).

Diverse group, with two major classes:

→ ***Monocots:*** They have one ***cotyledon***. ***E.g., grasses, lilies.***

→ ***Dicots:*** They have two ***cotyledons***. ***E.g., roses, sunflowers.***

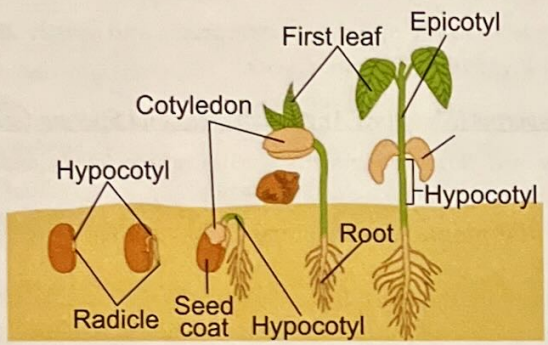


Flower to Fruit

Monocot vs Dicot

Monocots and dicots are the two broad groups of flowering plants.

Monocot vs Dicot



Germination of a Seed

Remember: Main plant body in Algae and Bryophytes is Gametophyte (n) while in Pteridophytes, Gymnosperms, and Angiosperms, it is Sporophyte (2n).

Some important facts to know:

- During seed germination, the part of the embryo which grows into root is **Radicle**.
- Endothermic reactions are driven by the energy provided by ATP.
- **Plant types:**

— Nepenthes- Insectivorous plant

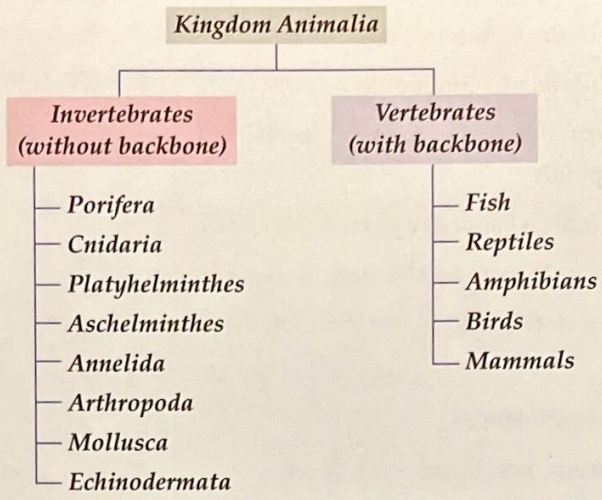
— Cuscuta- Parasitic plant

— Opuntia- Xerophytic plant

— Utricularia- Carnivorous plant

- Trigonella foenum graecum plants of the Fabaceae family are used as a spice, flavoring agent and food supplement.
- The numerical taxonomy in plants is based on all observable characteristics.
- ***Periblem*** is the middle layer in the root apical meristem that gives rise to the cortex.
- Hydrocolloids are the water holding compounds produced in large quantities by marine brown and red algae.

KINGDOM ANIMALIA



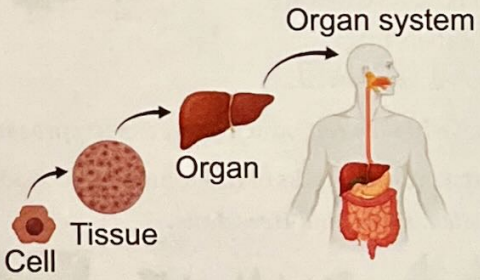
Let's first classify them under certain Parameters!

Kingdom Animalia

- They are eukaryotic and multicellular organisms.
- They are heterotrophic.
- Animal cells lack a rigid cell wall.
- ***Mobility:*** Most animals are capable of movement at some stage of their life cycle.
- Kingdom Animalia is classified into phylum on the basis of extent and type of body design differentiation found in them.

Body Level Organisation

- Body level organization refers to the *hierarchical arrangement of structures* within a living organism, from the smallest units to the entire organism. It involves five main levels: cells, tissues, organs, organ systems, and the organism.



On the Basis of Symmetry

- ***Asymmetrical:*** Asymmetry refers to the *lack of symmetry* in an organism's body plan. ***E.g. Porifera.***

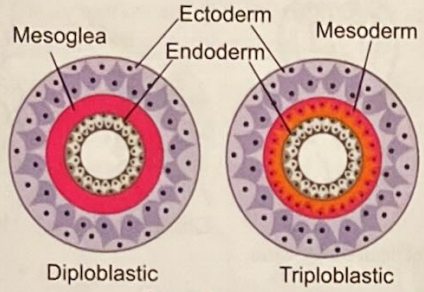
- ***Radial Symmetry:*** In radial symmetry, any plane passing

through the *central axis* divides the organism into *two equal halves*. *E.g. Coelenterata, Echinodermata.*

• ***Bilateral Symmetry:*** Bilateral symmetry is characterized by *a single plane of symmetry* that divides the organism into *left and right halves*. *E.g. Platyhelminthes, Arthropoda.*

On the Basis of Germ Layers

• ***Diploblastic:*** Animals with only *two* germ layers: *Ectoderm* (outermost germ layer) and *Endoderm* (innermost germ layer).



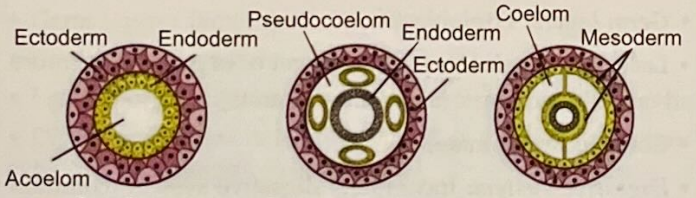
Germ Layers

• ***Triploblastic:*** Animals with *three* germ layers: *Ectoderm, Mesoderm* (middle germ layer), *Endoderm*. *E.g. Porifera, Coelenterate and Ctenophora are Diploblastic and rest all are Triploblastic.*

On the Basis of Coelom

→ *Coelom:* It is the *body cavity* present between the body wall, and the gut wall. Coelom has a mesodermal lining.

• ***Acoelomate:*** No coelom. *E.g. Porifera, Coelenterate, Ctenophora, Platyhelminthes.*



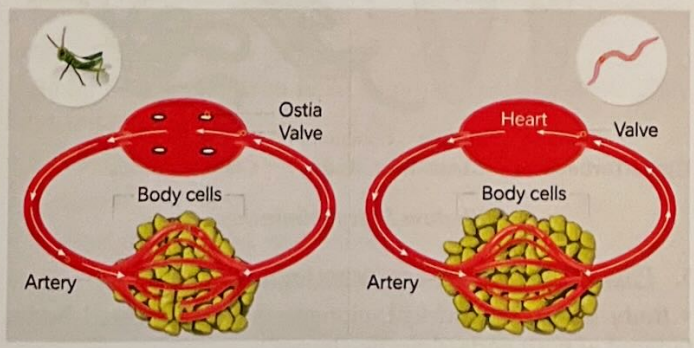
Acoelom (Porifera Coelenterata) | **Pseudo-Coelom (Aschelminthes)** | **True Coelom (Annelida to chordata)**

• ***Pseudocoelomate:*** False coelom. *E.g. Nematoda.*

• ***Eucoelomate:*** True coelom. *E.g. Annelida, Aschelminthes, Mollusca, Chordata.*

On the Basis of Circulatory System

• *Open Circulatory System:* It is a system where there is *no vessel to contain the blood* and it flows freely through the cavities of the body. *E.g. Arthropoda, Mollusca.*



Body segmentation refers to the division of an animal's body into repeating, similar units called segments. E.g. Seen in: Annelida, Arthropoda, Chordata.

• *Closed Circulatory System:* It is a system where the *blood is always contained within vessels* in the heart while circulating. *E.g. Annelida, Chordata.*

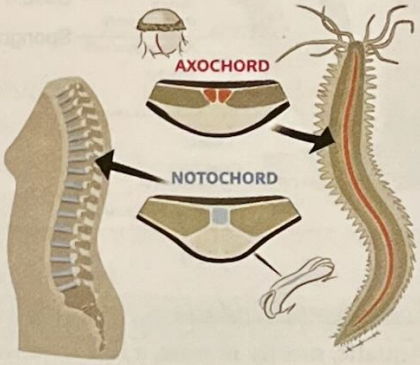
On the basis of digestive system

• **Open (incomplete) digestive system [Sac-like]:** single opening behaves as both mouth and anus. E.g. Coelentrata, ctenophora, platyhelminthes.

• **Closed (complete) digestive system:** tube in tube, e.g. rest of all.

Notochord

• The notochord is a *rod-like structure* made of a *cartilaginous* substance that develops in all chordates at early embryonic stages as a rudimentary backbone.



Notochord in Chordates

• It is derived from *mesoderm*.

• It is present in the *dorsal side* (upper side or back side of an animal). *E.g. Chordata.*

Now let's learn about each phylum in details!

All Phylums in order

Porifera
Coelenterate
Ctenophora
Platyhelminthes
Nematoda/Aschelminthes
Annelida
Arthropoda
Mollusca
Echinodermata
Chordata

Trick to Remember the order

PC² — Porifera, Coelenterate, Ctenophora
PA² — Platyhelminthes, Nematoda/Aschelminthes, Annelida, Arthropoda
MEC — Mollusca, Echinodermata, Chordata

1. Phylum Porifera

• ***Habitat:*** Mostly aquatic, marine, and a few freshwater species (E.g. Spongilla).

• ***Body symmetry:*** Asymmetrical.

• ***Body structure:*** Body is perforated with many tiny ***holes or pores (Ostium: Water canal system)***. Pores lead to a large central cavity called the ***Spongocoel***. They have specialized ***"collar cells"***.

• ***Level of organization:*** Cellular level organization (no true tissues or organs).

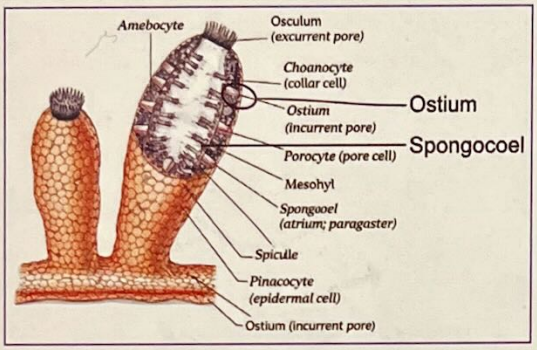
• ***Germ layer:*** Diploblastic (endoderm and ectoderm).

• ***Movement:*** Non-motile.

• ***Endoskeleton*** is present.

• They are ***hermaphrodites*** (possessing both male and female reproductive system).

• ***Other E.g. Euplectella (glass sponge), Sycon, Euspongia (bathing sponge).***



Sycon

2. <u>*Phylum Coelenterata/Cnidaria*</u>

• ***Habitat:*** Aquatic, mostly marine, a few freshwater species (E.g. Hydra).

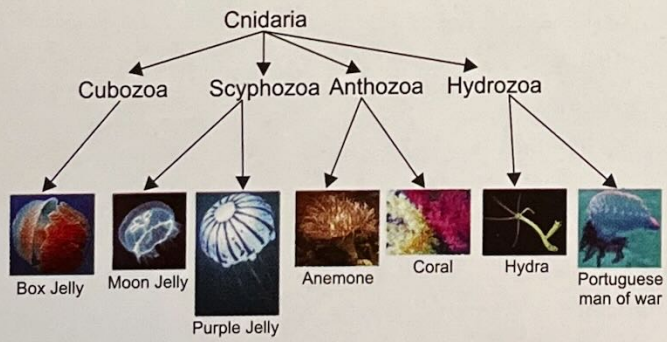
• ***Symmetry:*** Radial symmetry.

• ***Level of organization:*** Tissue level organization.

• ***Germ layers:*** Diploblastic.

• ***Body structure:*** Sac-like body with ***a central gastrovascular cavity*** ***(E.g. Coral, Hydra)*** having only one opening ***(hypostome)*** that serves as both mouth and anus. ***Tentacles*** surround the mouth, used for capturing food.

• ***Special cells:*** Stinging cells called ***Cnidoblast*** contain a stinging capsule known as ***Nematocyst***.



Phylum Coelenterata/Cnidaria

• Hard skeleton is developed outside the body called ***Exoskeleton*** (made of ***calcium carbonate***). ***E.g. Jellyfish, Aurelia.***

3. <u>*Phylum Ctenophora*</u>

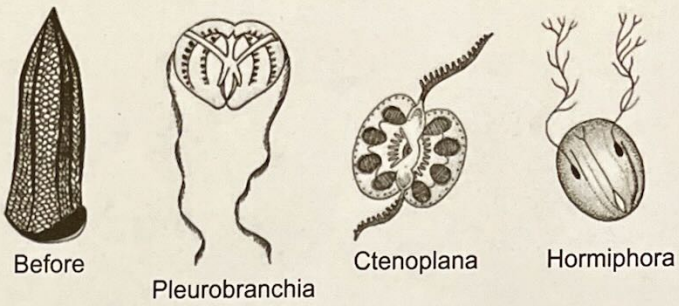
• ***Habitat:*** Exclusively marine.

• They exhibit ***bioluminescence.***

• ***Body symmetry:*** Radial symmetry.

• They are also known as ***Sea Walnuts*** and ***Comb Jellies***.

• ***Reproduction:*** Sexual reproduction. They are hermaphrodites. ***E.g. Pleurobrachia and Ctenoplana.***



Phylum Ctenophora

4. <u>*Phylum Platyhelminthes*</u>

• ***Body shape:*** Body is ***dorsoventrally flattened*** like a ribbon (flat from top to bottom). ***Suckers*** and ***hooks*** are present in few.

• ***Habitat and nature:*** They are either free living or parasitic and terrestrial. ***E.g. Planaria (free-living), Liverfluke (parasitic), Tapeworm.***

• ***Symmetry:*** Bilateral symmetry.

• ***Germ layers:*** Triploblastic.

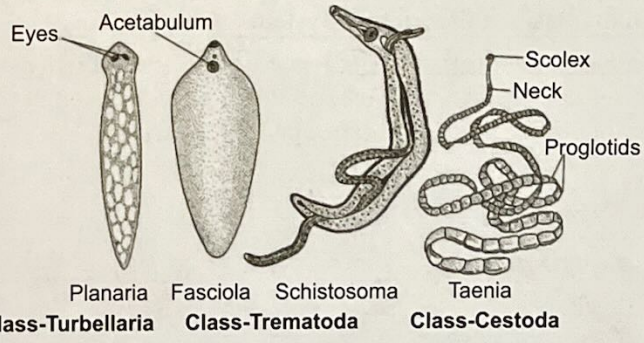
• ***Level of organization:*** Organ level of organization (more advanced than Porifera and Coelenterata).

• ***Coelom:*** Acoelomate.

• ***Digestive system:*** Incomplete digestive system (common opening for both mouth and anus). Anus is absent.

• ***Excretory system:*** Excretion and osmoregulation through specialized cells called ***flame cells***.

• They are ***hermaphrodites***.



Phylum Platyhelminthes

5. <u>*Phylum Aschelminthes/Nematodes*</u>

• ***Body shape:*** Cylindrical, elongated, unsegmented body, tapered at both ends (spindle-shaped).

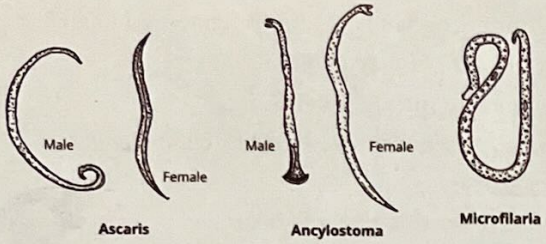
- *Symmetry:* Bilateral symmetry.
- *Germ layers:* Triploblastic.
- *Level of organization:* Organ level organization.
- *Coelom:* Pseudocoelomate.
- *Habitat:* Most forms are ***parasitic***, but some are ***free living*** in soil or water.
- *Digestive system:* Alimentary canal is complete (has both mouth and anus).

Animals show ***sexual dimorphism*** (males and females look different). Mostly ***unisexual*** (male and female are separate).

- *Excretory system:* ***Renette cells*** are present.

E.g. Ascaris (roundworm), Wuchereria (filarial worm), Ancyclostoma (hookworm).

Phylum Aschelminthes



Phylum Aschelminthes/Nematoda

6. Phylum Annelida

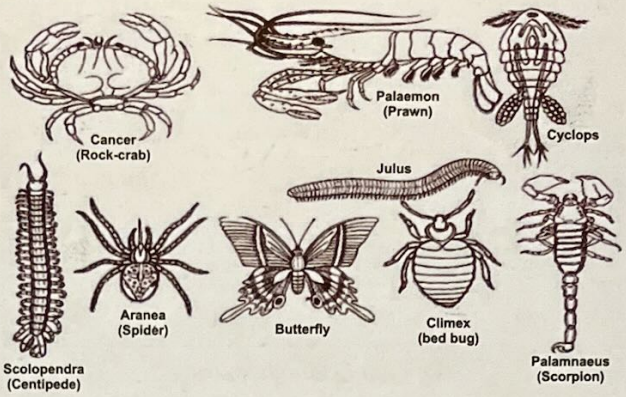
- *Body:* Dorsoventrally flattened, cylindrical, segmentation is present on body.
- *Symmetry:* Bilateral.
- *Germ layers:* Triploblastic.
- *Coelom:* Eucoelomate.
- *Level of organization:* Organ system level.
- *Digestive System:* Alimentary canal is ***tube like structure*** extended from mouth to anus.
- *Circulatory system:* Closed (blood flows in vessels).
- *Locomotion:* Through locomotory organs like ***parapodia*** (Nereis) that are lateral appendages.
- *Reproduction:* Sexual, some are hermaphrodites, some show asexual reproduction.
- *Excretory system:* ***Nephridia*** is present for osmoregulation and excretion.

E.g. Earthworms, Leech, Nereis, Hirudinaria, etc.

7. Phylum Arthropoda

- ***Largest phylum*** in Animal Kingdom → ***Insecta is the largest class.***
- *Body:* Segmented into head, thorax, and abdomen. They have joint appendages ***(jointed legs).***
- *Exoskeleton:* Made of ***chitin.***
- *Symmetry:* Bilateral.
- *Coelom:* True, filled with blood.
- *Habitat:* Terrestrial, aquatic, fresh or marine animals.
- *Germ layer:* Triploblastic.
- *Circulatory System:* Open circulatory system.
- *Respiration through:* Gills, trachea, or book lungs.
- *Excretion through:* ***Malpighian tubules.***
- *Reproduction:* Mostly unisexual, sexual dimorphism is common.
- *Digestive system:* Alimentary canal is complete.

E.g. Spider, scorpio, crab, silver fish, cray fish, etc.



Phylum Arthropoda

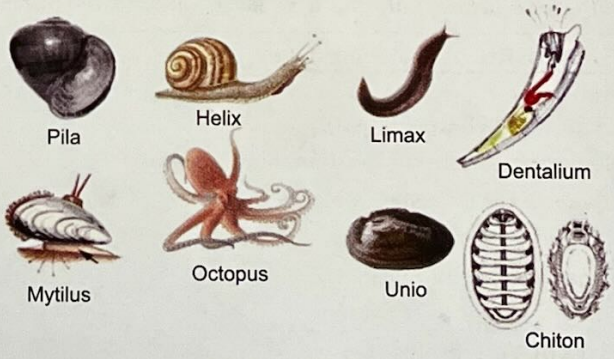
8. Phylum Mollusca

- It is the ***second largest phylum*** of Animal Kingdom.
- *Body:* Soft, little segmentation. The body is divided into head, foot, and in ***mantle*** (a fold of thin skin).
- *Covering:* Most have a ***calcareous shell*** (snails).
- *Symmetry:* Bilateral.

Devil fish is common name of Octopus.

- *Coelom:* Eucoelomate.
- *Circulatory System:* Mostly open; ***closed in octopus and squid.***
- *Respiration:* Gills or lungs.
- *Digestive system:* Alimentary canal is complete.
- *Excretory system:* Kidney-like organs called ***nephridia*** is present for excretion.
- *Reproduction:* Unisexual, external or internal fertilization.
- They have ***blue color blood*** due to ***Haemocyanin.***

E.g. Octopus, snails (pila), oysters, squid, etc.

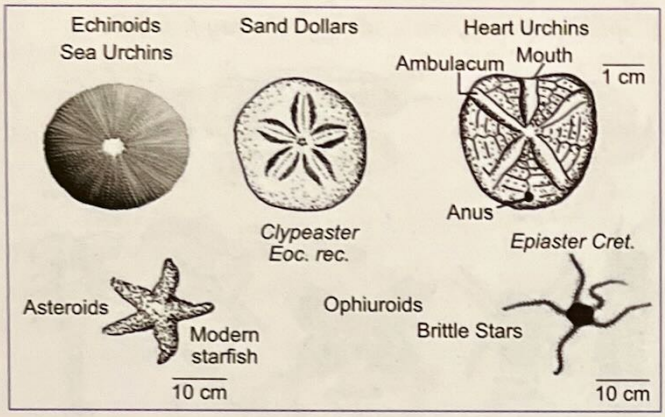


Phylum Mollusca

9. Phylum Echinodermata

- *Body:* Star-shaped, spherical, elongated. They are spiny-skinned organisms with no segmentation on body.

- ***Symmetry:*** Radial.
- ***Coelom:*** Eucoelomate.
- ***Germ layer:*** Triploblastic.
- ***System of organization:*** Organ system. ***E.g. Sea urchins, starfish, Holothuria, sea cucumber.***

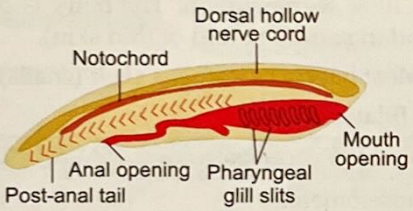


Phylum Echinodermata

10. Phylum Chordata

- They ***have a notochord*** (rod-like supportive structure).

Remember: Hemichordata is not a sub-phylum under Chordata. It consists of small group of worm like animals.



- They have ***pharyngeal gill slits*** in pharynx.
- Heart is ***ventral***.
- ***Circulatory system:*** Closed circulatory system.
- ***Coelom:*** Eucoelomate.
- ***Symmetry:*** Bilateral
- ***Germ layer:*** Triploblastic
- ***Level of organization:*** Organ level of organization.
- Phylum Chordata is divided into two major groups: ***Protochordata*** and ***Vertebrata***.

Protochordata have notochord, but never form a verbal column.

Characteristics of Protochordata

- They ***do not have proper notochord*** (present only in larval stage or not well developed).
- No vertebral column, post anal tail present.
- Bilateral, triploblastic, coelomate.
- Nerve cord is present.
- ***Germ layer:*** Triploblastic.
- Pharyngeal gill slits present.

Classes of Vertebrates

1. Cyclostomata

- They are jawless vertebrates.
- They have elongated ***eel-like body***, circular mouth, and slimy skin.

E.g. Petromyzon/Myxine, hog fishes, lamprey.

2. Pisces

- They are fishes. ***E.g Dog fish, shark, tuna, sea horse, etc.***
- Pisces have ***two chambered*** heart.

3. Amphibians

- They use ***mucous glands*** or ***gills*** for respiration.
- They have ***three-chambered*** heart.
- They are ***cold blooded*** animals.
- They breathe through lungs or gills (in water) and skin (in land).

Amphibians

Amphibians

E.g. Frogs, toads, salamander.

Turtle

4. Reptiles

- They have ***three-chambered*** heart.

{**Exception:** Crocodile (has four-chambered heart)}.

- They are ***cold blooded*** animals.
- They breathe through their lungs.

E.g. Snake, turtle, lizard, crocodile, chameleon.

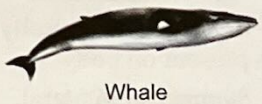
5. Aves (Birds)

- They have ***four-chambered*** heart.
- They are ***warm blooded***.
- They ***lay eggs*** (oviparous).

Birds

6. Mammals

- They have ***four-chambered*** heart.
- They are ***warm blooded***.


Whale

- They have ***mammary glands*** (viviparous).

Exception: Platypus and echidnas (lay eggs).

Groundhog

E.g. Dolphin, whale, humans, etc.

Some important facts to know:

- The ability of corals to make their skeletons primarily depends on their ***pH***.
- ***Jatinga*** is also known for the strange phenomenon of alleged bird suicides.
- ***Pinctada margaritifera*** is a black lipped pearl oyster found in Indo-Pacific, within tropical coral reefs.
- Invertebrates have a pair of solid nerve cords, situated ventrally and bearing segmentally arranged ganglia.
- Hypostome is a hairpin-like structure that serves to anchor and stabilize the tick's mouthparts to its host's skin and to channel the exchange of fluids.
- ***Eudorina*** is an algae that undergoes anisogamous fusion of gametes.

• **Subphylum**	**Animal**
Hexapoda	Mosquito
Crustacea	Daphnia
Myriapoda	Julus
Chelicerata	Limulus

NERVOUS SYSTEM

• The nervous system is a complex network of cells and nerves that *controls* and *coordinates the body's functions*. It includes the brain, spinal cord, and all the nerves that connect these organs to the rest of the body.

- *Nervous System*
  - *Central Nervous System*
    - Brain
    - Spinal Cord
  - *Peripheral Nervous System*
    - Nerves emanating from Brain and Spinal Cord

Central Nervous System

• The central nervous system (CNS) is the body's primary control center, responsible for processing information and coordinating bodily functions. It's made up of the brain and the spinal cord.

Functions of CNS:

• It collects signals from sense organs (eyes, ears, skin, etc.).

• It sends signals to muscles and glands to respond appropriately.

• It controls voluntary (walking, writing, speaking, etc.) and involuntary movements (heartbeat, digestion, etc.).

• The CNS plays a crucial role in thermoregulation, the process of maintaining a stable body temperature.

• The CNS specifically the hypothalamus, plays a crucial role in controlling both hunger and thirst.

Human Brain

• The human brain is the main organ of the central nervous system (CNS).

• It is protected by the skull and surrounded by *cerebrospinal fluid.*

• It controls all body functions, including movement, emotions, thoughts, memory, and senses.

• Weight

— Male: 1400-1500 g

— Female: 1200-1300 g

• The brain floats in Cerebrospinal fluid that's why its effective weight reduces to nearly 50 g.

• Inside the skull, the brain is covered by the cranial meninges.

Pain receptors are present in meninges.

Meninges consists of three layers:

- *Dura Mater:* Outer layer.
- *Arachnoid Mater:* A very thin middle layer.
- *Pia Mater:* Inner layer (which is in contact with the brain tissue).

• *Total number of bones in skull:* 22 → *Facial bones (14)* and *Cranial bones (8).*

The adult brain accounts for mere 2% of body weight but consumes:

• *20%:* O_2

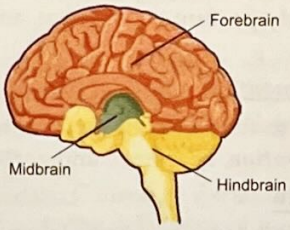
• *20-25%:* Glucose (our brain demands half of the sugar energy).

The human brain can be divided into three major parts:

1. Fore Brain

• The "forebrain" refers to the *anterior (front) part of the brain,* and it's the largest section of the brain.

• It controls all the *voluntary movements* and higher-level cognitive functions like thinking, memory, and consciousness.



• *Parts of Fore Brain: Cerebrum, Thalamus, Hypothalamus.*

(a) Cerebrum

• It is the largest part of the brain.

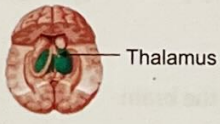
• The left and right cerebral hemispheres are connected by a thick band of nerve fibers called the *corpus callosum.*

• The outer layer of cell, which covers the cerebral hemisphere is called *cerebral cortex* (referred to as grey matter due to its greyish appearance).

• Cerebrum is responsible for *memory and learning.*

(b) Thalamus (Pain and Sensation)

• It is the major coordinating centre for *sensory* and *motor signalling.*



• Thalamus works as a *"Relay Station"*, it takes information from the body and sends it further to cerebral cortex (Body senses → Thalamus → Cerebral cortex).

• Touch, taste, sound → these senses are processed by Thalamus to Cerebral Cortex.

(c) Hypothalamus

• Hypothalamus lies at the *base of thalamus.*

• It controls Autonomic Nervous System and is required for *regulating inner body temperature, eating, drinking* and *vomiting.*

• It contains several groups of neurosecretory cells, which secretes hormone called *hypothalamic hormones.*

2. Mid Brain

• It is located between *Hypothalamus of forebrain* and *pons of hindbrain.*

• It is involved in several functions such as: *Motor control,* particularly eye movements and processing of vision and hearing.

3. Hind Brain

• *Parts of Hind Brain: Pons, Cerebellum, Medulla Oblongata.*

(a) Pons

• It is the middle portion of the brain that coordinates *face and eye movements, facial sensations, hearing and balance.*

(b) Cerebellum

• It maintains body posture and balance, and is also known as *"little brain"*.

(c) Medulla Oblongata

• It is connected to the *spinal cord*. It controls involuntary actions like *respiration, heartbeat*, and *gastric secretions*.

Lobes of the Brain

• The brain is divided into four main lobes: frontal, parietal, temporal, and occipital.

1. *Frontal Lobe*

• *Location:* Front of the brain.

• *Functions:* Reasoning, planning, problem-solving, motor control, emotional regulation.

2. *Parietal Lobe*

• *Location:* Behind the frontal lobe.

• *Functions:* Processes sensory information (touch, pain, temperature), spatial awareness.

3. *Temporal Lobe*

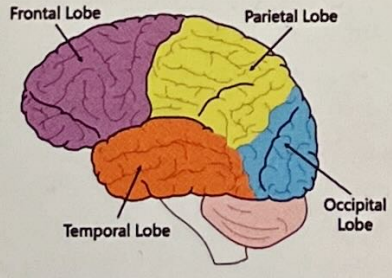
• *Location:* Sides of the brain.

• *Functions:* Auditory processing, language comprehension, memory, emotions.

4. *Occipital Lobe*

• *Location:* Back of the brain

• *Functions:* Visual processing, understanding spatial relationships.



Spinal Cord

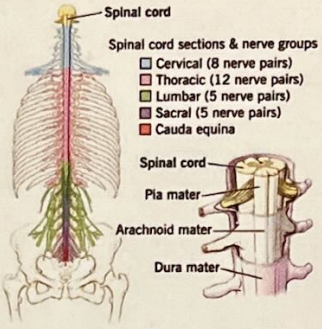
• The spinal cord transmits *signals* from the *brain to the body* and *sensory information* from the *body back to the brain*. It also plays a role in coordinating reflexes.

The Spinal Cord is divided into three sections:

1. *Cervical:* Neck.
2. *Thoracic:* Upper back.
3. *Lumbar:* Lower back.

Peripheral Nervous System (PNS)

• The peripheral nervous system (PNS) is a network of nerves that extends from the CNS (brain and spinal cord) throughout the body, connecting it to *all other parts*.



→ There are a total of 31 pair of nerves connected to the spinal cord.

- *Cervical:* 8 nerve pairs.
- *Thoracic:* 12 nerve pairs.
- *Lumber:* 5 pairs of nerves.
- *Sacral:* 5 pairs of nerves.

Peripheral Nervous System (PNS)

The final nerve is a bundle at the base of spine called "cauda equina" that gives sensation to your lower body.

1. **Somatic Nervous System:** The somatic nervous system is a part of the peripheral nervous system that controls *voluntary movements* of skeletal muscles and receives sensory information from the skin, muscles, and joints.

   Types:

   (a) **Sensory Nervous System:** They carry information from *body organs to CNS*. They are also known as *Afferent Nerves*.

   (b) **Motor Nervous System:** They carry information from *CNS to body organs*. They are also known as *Efferent Nerves*.

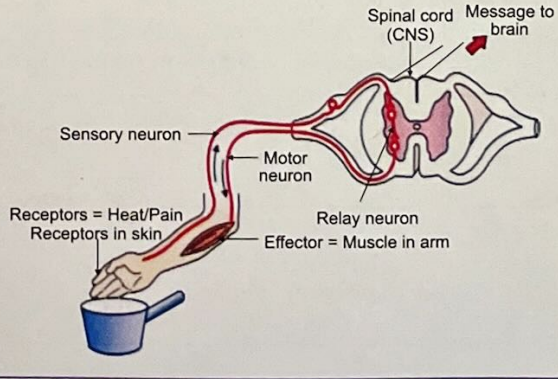
2. **Autonomic Nervous System:** The autonomic nervous system is a part of the peripheral nervous system that regulates *involuntary physiologic processes* including heart rate, blood pressure, respiration, digestion, and sexual arousal.

   Types:

   (a) **Sympathetic Nervous System:** They control the body's *"Flight-or-Fight"* response (help you in times of need, such as danger or stress).

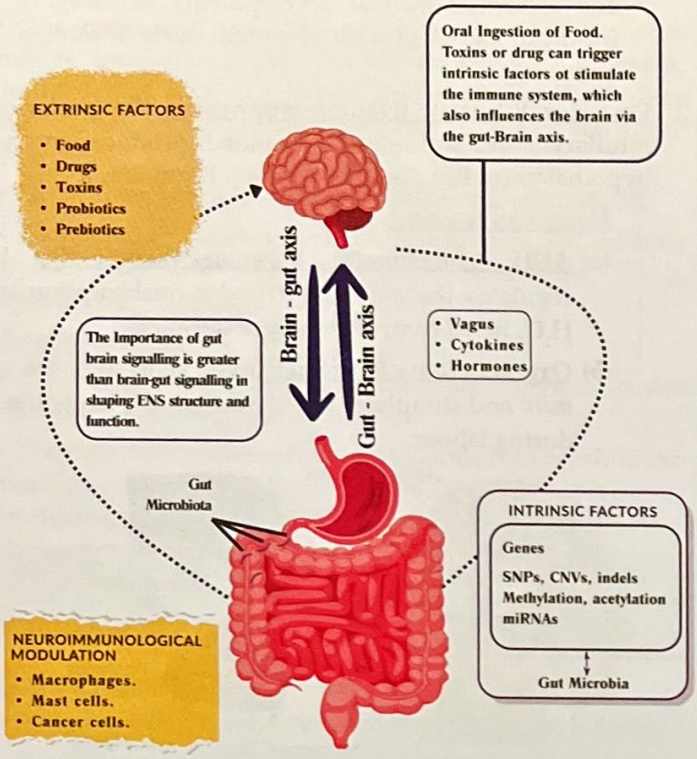
   (b) **Parasympathetic Nervous System:** They control the body's *"Rest and Digest"* response (It relaxes the body's system and return them to normal).

Pathway to Peripheral Nervous System



• *Pathway: Stimulus (Heat) → Receptors → Sensory Neuron → Spinal Cord (Relay Neuron) → Motor Neuron → Muscle (Effector) → Response (Hand moves away)*

Enteric Nervous System



Brain Diseases

1. ***Meningitis:*** Meningitis is a serious medical condition where the protective membranes (called ***meninges***) covering the brain and spinal cord ***become inflamed.***
2. ***Alzheimer's Disease:*** Alzheimer's disease is a ***progressive brain disorder*** that slowly destroys memory, thinking skills, and the ability to carry out simple tasks. It is the most common cause of ***dementia*** (loss of memory) in older adults.
3. ***Amnesia:*** Amnesia is a condition where a person ***loses their memory,*** either partially or completely. It affects a person's ability to remember past experiences or form new memories.
4. ***Tay-Sachs Disease:*** Caused by the accumulation of lipids in the brain due to the deficiency or inactivation of lipid digesting enzymes.
5. ***Parkinson's Disease:*** Loss of dopamine-producing neurons.
6. ***Huntington's disease:*** Genetic mutation (HTT gene).

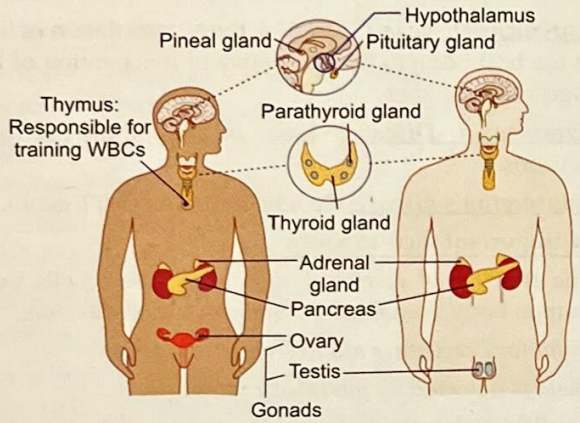
Some important facts to know:

- The transfer of electrical signals by nerve cells in the human body is enabled by ***Sodium*** and ***Potassium.***
- ***Olfactory receptors*** aid in smell perception.
- Taste is detected by ***gustatory receptors.***
- Camillo Golgi and Santiago Ramon y Cajal received the Nobel Prize in 1906 for his work on the structure of the nervous system.

GLANDS AND HORMONES

- Glands are organs in the body that produce and release substances, either hormones or other chemicals, to perform specific functions.
- *Types of glands:* *Endocrine Glands* and *Exocrine Glands*.

Endocrine Glands	Exocrine Glands
They release hormones	They release enzymes
They release hormones directly into the blood	They secrete their enzymes using a duct
They are ductless glands	They have ducts



Overview of Endocrine Glands

Major Endocrine Glands

Pituitary Gland

- It is also known as the *"master gland"*, this *pea-sized* gland is located at the base of the brain.
- It produces hormones that regulate other endocrine glands, including growth hormone, prolactin, and oxytocin.
- The pituitary gland is controlled by *hypothalamus*.

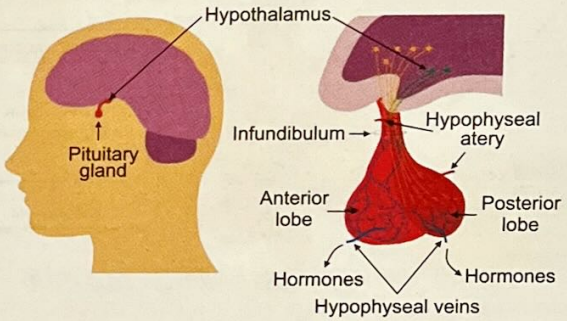
> - *Hormones discovered by; E. H. Starling.*
> - *1st hormone discovered: Secretin (1902).*

Hypothalamus

- The hypothalamus is a brain region crucial for regulating many bodily functions, including *hormone release, body temperature, hunger,* and *sleep-wake cycles*.
- The hypothalamus is responsible for regulating the secretion of hormones, and the pituitary gland releases these hormones into the bloodstream.

Pituitary Regions

1. **Anterior Pituitary (Adenohypophysis):** The anterior pituitary produces and secretes a variety of hormones that regulate various physiological processes, including growth, metabolism, reproduction, and stress response.
   - *Hormones released:*
   - *(a)* *Growth Hormone (Somatotropin):* *GHRH* (Growth hormone-releasing hormone) releases *growth hormones* in anterior pituitary.
   - *(b)* *Prolactin* It is involved in formation of milk.
     - *Deficiency of GH leads to:* *Dwarfism* (shortness in height due to genetic or medical condition).
     - *Excess of GH causes:* *Gigantism* (excessive growth and abnormal skeletal development), *Acromegaly* (result in excess growth of certain parts of human body).
2. **Posterior Pituitary (Neurohypophysis):** The posterior pituitary stores and releases hormones produced by the hypothalamus, but does not produce hormones itself.
   - *Hormones released:*
   - *(a)* *ADH (Antidiuretic hormone)/Vasopressin:* It regulates the *amount of water* (reabsorption of H_2O, helps control blood pressure).
   - *(b)* *Oxytocin (Love hormone):* Involved in *secretion of milk* and stimulates the *uterine muscle* to contract during labour.



Anterior and Posterior Pituitary

Pineal Gland

- The pineal gland is a tiny endocrine gland in the *middle of our brain* that helps regulate body's circadian rhythm by secreting the hormone *melatonin*.
- Tryptophan (amino acid) - Serotonin (converted in) - Melatonin.

> *Melatonin is a hormone secreted by the pineal gland in response to darkness, often called the "hormone of darkness". It helps regulate the sleep-wake cycle by sensing light and dark through signals received from the retina of the eye.*

Thymus

- Located in the upper chest, behind the sternum (breastbone) and in front of the heart.
- It plays a crucial role in the *immune system*, especially during childhood.
- It is responsible for the *maturation of T-lymphocytes* (T-cells), which are essential for fighting infections.
- Training centre for lymphocytes (antibodies).

> *Serotonin hormone regulates moods and feelings.*

Thyroid Gland

- The thyroid is a *butterfly-shaped gland* located in the neck.
- It produces a hormone called *thyroxine*, which plays a vital role in increasing the body's metabolism.

• The production of thyroxine requires iodine, a mineral obtained from our diet.

• A deficiency of iodine can lead to ***hypothyroidism***, a condition where the body doesn't produce enough thyroid hormone.

• This deficiency may also cause the thyroid gland to enlarge, leading to a condition known as ***goitre***. An excess production of iodine can result in ***hyperthyroidism***, where the thyroid becomes overactive and produces too much thyroxine.

• ***Calcitonin-*** Helps in regulating calcium level in blood.

• T3 (triiodothyronine) and T4 (thyroxine) are primary thyroid hormones ***regulating body metabolism, energy production, growth, and development***.

Parathyroid Gland

• The parathyroid glands are ***four small glands*** located behind the thyroid gland in the neck.

• The main role of the parathyroid glands is to ***regulate the level of calcium*** in the ***blood*** and ***bones***. They do this by producing a hormone called ***parathyroid hormone*** (PTH).

> ***Diabetes Insipidus is caused when the body produces too much urine and is not able to retain water (due to lack of ADH/Vasopressin).***

Adrenal Gland

• It is a ***cap-like structure*** located above both the kidneys.

• It releases ***Adrenal hormone*** → also known as ***"Flight-or-Fight hormone"***.

• It increases the blood pressure, heart rate, and metabolism in response to stress level.

• ***Deficiency causes:*** ***Addison's disease*** (a rare chronic condition in which your adrenal glands don't produce enough of the hormones cortisol (stress hormone) and aldosterone).

Hormones:

• ***Cortisol-*** Regulates metabolism, blood sugar levels and helps the body manage stress.

• ***Aldosterone-*** Regulates blood pressure by controlling salt and water balance.

• ***Androgens-*** Precursors for sex hormones that influence secondary sexual characteristics.

• ***Epinephrine/Adrenaline & Norepinephrine/Noradrenaline-*** Responsible for the ***fight and flight*** response, increasing heart rate, blood pressure and energy levels during acute stress.

Major Exocrine Glands

Sweat Glands

• They release sweat, a secretion, onto the skin's surface through ducts.

Alright Let's Solve this one?
Q. Can you recall the function of saliva in digestion?

Salivary Glands

• These glands are a type of exocrine gland located in and around the oral cavity. They produce saliva, a fluid essential for digestion, lubrication, and protection of the mouth.

Liver

• The liver is positioned in the ***upper right portion*** of the abdomen, beneath the diaphragm. It is a large organ.

• The liver is responsible for numerous functions, including filtering blood, producing bile for digestion, metabolizing proteins, carbohydrates, and fats, and storing glycogen and vitamins.

Stomach

• The stomach helps break down food by squeezing it (mechanical) and mixing it with acids (HCl) and enzymes (chemical). ***Ghrelin*** released by stomach stimulates appetite hence it is known as ***"Hunger Hormone"***.

Heterocrine/Mixed Glands

• A heterocrine gland is a gland that functions as both an endocrine gland and an exocrine gland.

Examples of heterocrine glands:

Pancreas

• Pancreas releases both hormones and enzymes (covered in digestive system) thus acting as a ***mixed gland***.

• It is the ***second largest gland*** of our body.

Hormones released by pancreas:

• ***Islets of Langerhans:*** These are cells scattered throughout the pancreas.

  Types:

  • ***α-Cells:*** Produces ***Glucagon*** → converts ***Glycogen to Glucose*** through ***Glycogenolysis***.

  • ***β-Cells:*** Produces ***Insulin*** → converts ***Glucose to Glycogen*** through ***Glycogenesis***. ***Diabetes Mellitus*** is caused when not enough insulin is produced by the body.

Gonads

• They are the primary ***reproductive organs***.

Gonads include:

• ***Testes:*** In ***male*** → releases ***testosterone*** hormone.

• ***Ovary:*** In female → releases ***Estrogen*** (responsible for female characteristics) and ***Progesterone*** (it supports menstruation and maintains pregnancy).

> ***The Atrial wall of human heart secretes a very important peptide hormone known as: ANF (Atrial Natriuretic Factor). ANF helps regulate the blood pressure.***

PLANT HORMONES AND MOVEMENT

Hormones	Functions
Auxin	Elongation of stem
Gibberellin	Germination or flowering in plants
Cytokinin	Cell division
Abscisic Acid	Stress hormone that inhibits growth
Ethylene	Gaseous hormone responsible for fruit ripening

- Auxin - promotes apical dominance.
- Cytokinin- Delays senescence (prevents aging of plants) and inhibits apical dominance.

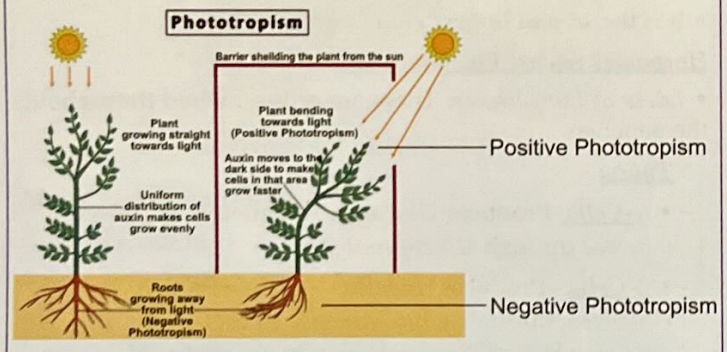
Plant Movements

- ***Plant movements are of two types:*** ***Tropic Movements*** and ***Nastic Movements.***

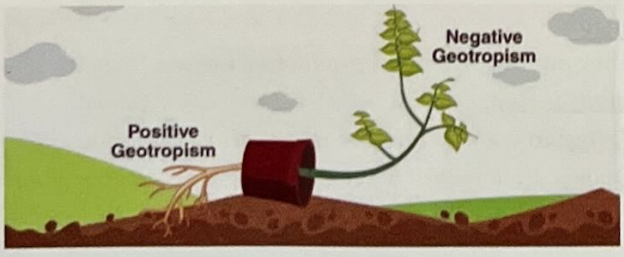
1. **Tropic Movements:** They are ***directional*** and occur in response to stimuli like light, gravity, water, and chemicals. They can be positive or negative.
   - *(a)* ***Positive Tropism:*** When a plant part ***moves towards the stimulus,*** it's considered positive tropism.
   - *(b)* ***Negative Tropism:*** When a plant part ***moves away from the stimulus,*** it's considered negative tropism.

Types of Tropic Movements:

1. ***Phototropism:*** Movement of plant in response to ***light.*** Shoots bend towards light (positive), while roots bend away from it (negative).
2. ***Geotropism:*** Movement in response to ***gravity.*** Roots grow ***downwards*** towards the gravity (positive growth), while shoots grow ***upwards*** away from the gravity (negative growth).

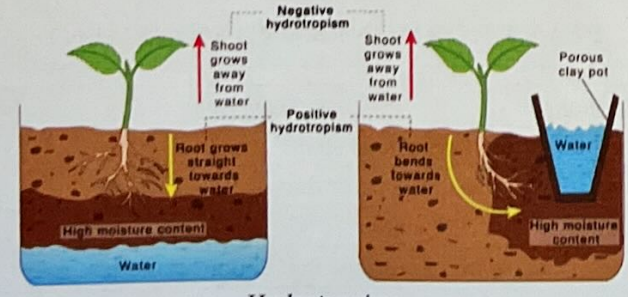


Phototropism



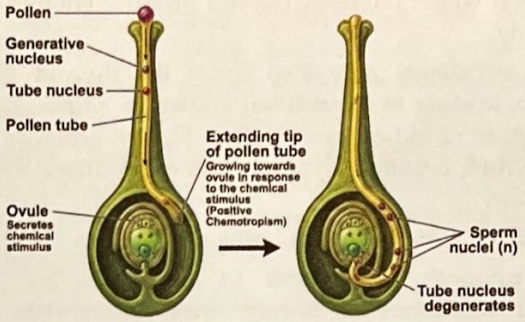
Geotropism

3. ***Hydrotropism:*** Movement in response to ***water.*** Roots grow towards water sources (positive growth).



Hydrotropism

4. ***Chemotropism:*** Movement in response to ***chemicals.*** ***E.g. The movement of pollen tubes towards the ovary during fertilization.***



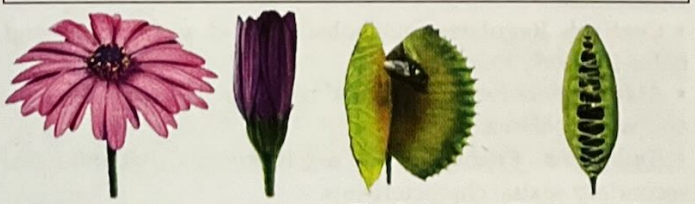
Chemotropism

- A crescograph is a device which is used for measuring the growth in plants.
- ***Sir Jagdish Chandra Bose,*** an Indian botanist and biologist invented this device in 1919.
- He is famous for demonstrating that plants can respond to stimuli and 'feel' pain and pressure.

2. ***Nastic Movements:*** They are ***non-directional movement*** of a plant part in response to an external stimulus, such as light, touch, or temperature.

   Types:
   - *(a)* ***Photonastic Movement:*** The non-directional movement of plant part, usually flower petals, in response to changes in ***light intensity.***
   - *(b)* ***Thigmonastic Movement:*** A non-directional response of plant or fungus to ***touch or vibration.***

- **Touch me not plants (Mimosa pudica):**
  – The leaves of the Mimosa pudica plant folds when they are touched because of change in the water content of leaf cells by using electrical chemical signals.



Photonastic Movement *Thigmonastic Movement*

Some important points to know:

- Soybean products contain ***phytoestrogen*** which are similar to one of the human hormones.
- ***Heliophytes:*** Plants that are adapted to live under plenty of sunlight.
- ***Halophytes:*** Salt tolerant plants.
- The broad green part of the leaf is called ***Lamina.***
- ***Smooth endoplasmic reticulum*** is associated with the production and metabolism of fats and steroid hormones.

REPRODUCTION

• Reproduction is the biological process by which living organisms produce offspring to continue their species.

• It is not essential for individual's survival, but is crucial for survival of a species.

Reproduction

Asexual Reproduction | **Sexual Reproduction**

Asexual Reproduction	Sexual Reproduction
Only one parent plant is involved	Both male and female parents are involved
Occurs in unisexual plants	Occurs in bisexual plants
Occurs in lower plants	Occur in higher plants
Genetic similarity is commonly seen here	Genetic diversity is commonly seen here
Reproductive organs are not present	Fully developed reproductive parts are present
Asexual reproduction is rapid and genetically similar.	Sexual reproduction is slow and genetically dissimilar.

Metagenesis: A type of life cycle in which one generation of plants or animals ***reproduce asexually, followed by sexually reproducing generation*** i.e., some individual of species are diploid and some are haploid.

E.g. Obelia.

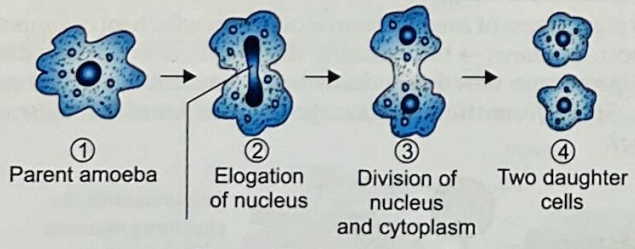
ASEXUAL REPRODUCTION

Types of Asexual Reproduction

1. Binary Fission

• It is a process of asexual reproduction in which a ***unicellular organism divides into two organisms.***

• It is common only in unicellular organisms. *E.g. Amoeba.*

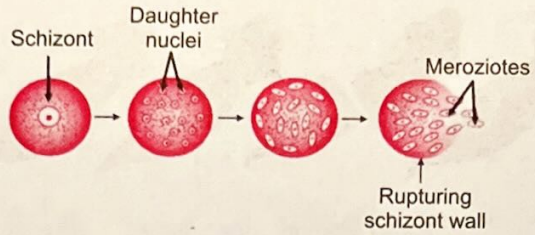


Binary Fission in Amoeba

2. Multiple Fission

• It is a process of asexual reproduction in which the ***nucleus divides multiple times***, and the cytoplasm divides later to form daughter cells.

• Many offsprings are produced. *E.g. Plasmodium (malarial parasite).*

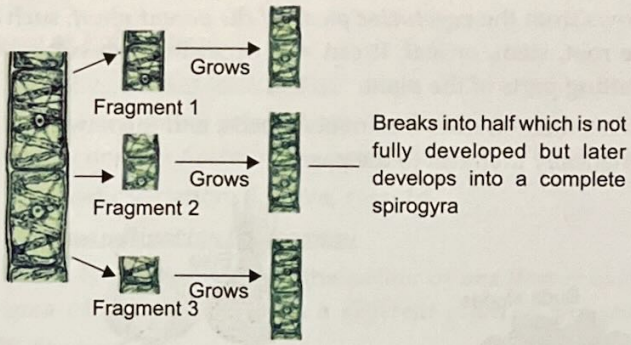


Multiple Fission in Plasmodium

3. Fragmentation

• It is a process of asexual reproduction in which the ***body breaks into pieces***, and ***each fragment*** grows into a new organism.

• It occurs in ***simple multicellular organisms. E.g. Spirogyra (green algae), Rhodophyte (red algae), and sea anemone.***



Fragmentation in Spirogyra

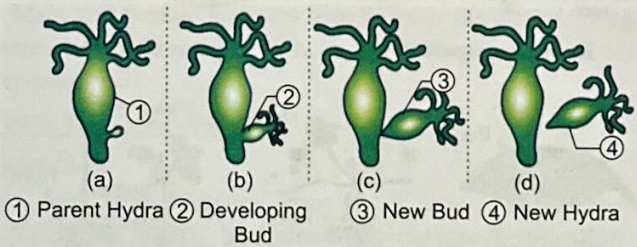
4. Budding

• It is a process of asexual reproduction in which a new organism develops from a ***bud or outgrowth*** on the parent organism.

• A small bud forms on the parent body due to cell division. It grows and detaches to form a new organism.

• It occurs in ***simple multicellular*** and ***unicellular organisms.***

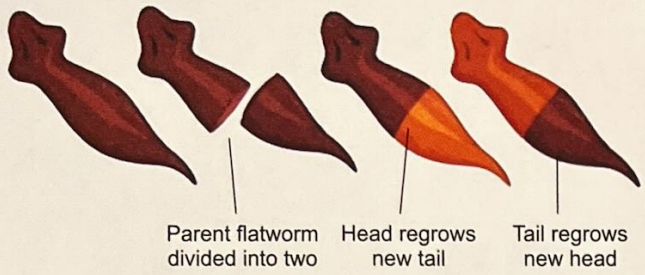
E.g. Hydra (multicellular) and Yeast (unicellular).



Budding in Hydra

5. Regeneration

• It is a process of asexual reproduction in which a new organism develops ***from a part of the original organism. E.g. Planaria, Hydra.***

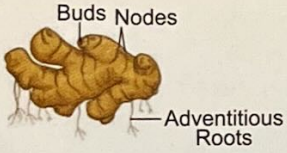


Regeneration in Planaria

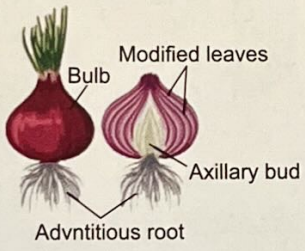
Note: In higher organisms like lizards, tail regeneration does not form a new organism → just a part.

6. Vegetative Propagation

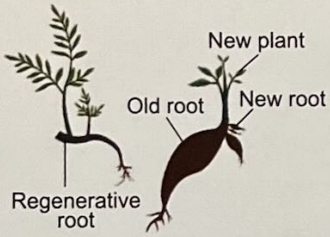
- It is a process of asexual reproduction in which a new plant grows from the *vegetative parts of the parent plant*, such as the root, stem, or leaf. It can also occur through cutting or grafting parts of the plant.
- This method does not involve seeds, and the new plant is genetically identical to the parent.



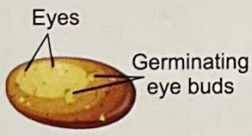
Rhizome (Ginger)



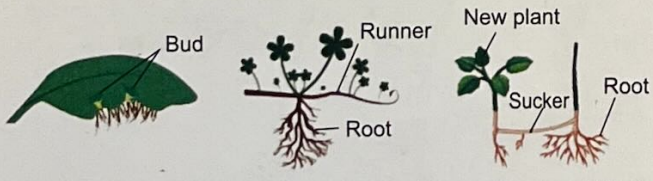
Bulb (Onion)



Root Propogation



Tuber (Potato)



Leaf Bryophyllum *Runner (Oxalis)* *Sucker (Mint)*

Vegetative Propagation in Few Plants

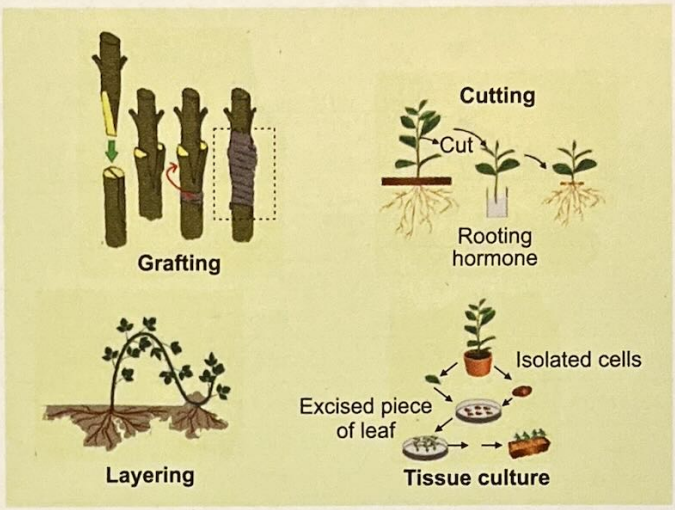
The buds in potato are called "eyes", they are axillary buds located at the nodes of stem. These eyes can grow into a new potato plant.

Types of Vegetative Propagation:

(a) **Cutting:** A *part of plant (stem or leaf)* is cut and planted into the soil. *E.g. Rose plant, money plant, banana plant, sugarcane plant.*

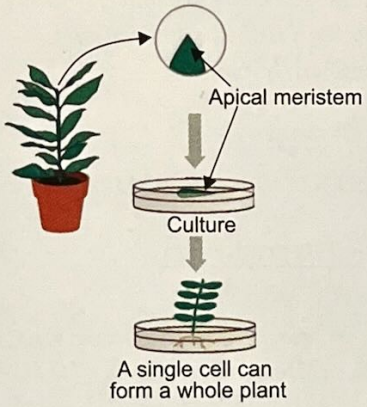
(b) **Layering:** The stem of *the plant is bent to the ground* and covered with soil. *E.g. Lemon, strawberry.*

(c) **Grafting:** Cutting from *some other plant attached to the stem* of the plant and planted into the soil. *E.g. Rose plant.*



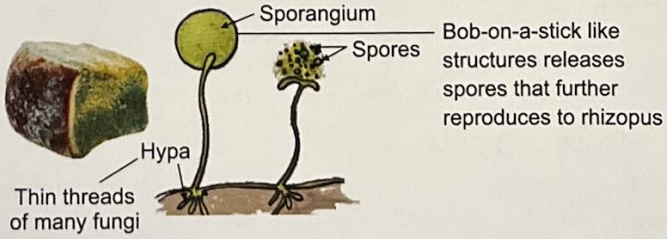
7. Tissue Culture

- Tissue culture is a modern method of asexual reproduction used to grow new plants from a small group of *cells or tissues in a laboratory* under sterile conditions. *E.g. Tissue culture is widely used in ornamental plant like snake plant. Cost of such plants are very high.*



8. Spore Formation

- It is a process of asexual reproduction in which an organism produces *spores* → tiny, usually single-celled structures, that can grow into new individuals under favorable conditions. *E.g. Spore formation in Rhizopus (bread mould) a type of fungi.*



Spore Formation in Rhizopus

SEXUAL REPRODUCTION IN PLANTS

• Sexual reproduction in plants involves the fusion of male and female gametes (pollen and ovule) to form a zygote, which develops into a seed that grows into a new plant.

• This process occurs through flowers, the reproductive organs of plants.

• In *syncarpous* conditions, more than one pistil fuse together.

• ***Androecium***- All male parts of plants.

• ***Gynoecium*** - All female parts of plants.

• Chlamydomonas is considered unicellular green algae.

Types of Flowers

1. ***Bisexual Flowers (Hermaphrodite Flowers)***

• These flowers contain *both male (stamens)* and *female (pistil)* reproductive organs in the same flower.

• They are capable of *self-pollination* as well *as cross-pollination.*

E.g. Hibiscus, mustard, lily, sunflower.

2. ***Unisexual Flowers***

• These flowers contain *only one reproductive organ* → either stamens or pistil, but not both.

• They are capable of *cross-pollination*. ***E.g. Male flower that has only stamens → Corn, Cucumber, Female flower that only has carpels → Papaya, watermelon.***

→ ***Monoecious Plants:*** Male and female reproductive parts are present on the *same plant*. ***E.g. Maize, cucumber.***

→ ***Dioecious Plants:*** Male and female reproductive parts are present on *separate plants*.

E.g. Papaya, date palm.

Anatomy of a Flower

• Male reproductive part (collectively called *Stamen*) consists of:

→ ***Filament:*** Supports anther.

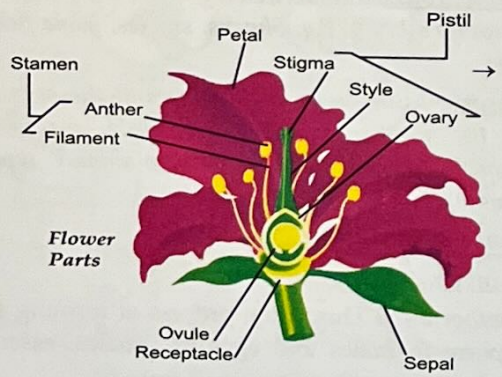
→ ***Anther:*** Produces *pollen* (yellow colour).

• Female reproductive part (collectively called *Pistil*) consists of:

→ ***Stigma:*** Sticky bulb that catches pollen.

→ ***Style:*** Passageway for pollen.

→ ***Ovary:*** The part of pistil that holds the eggs awaiting fertilization and later becomes the *fruit.*



• ***Isogamy:*** Fusion of morphologically similar gametes (same size and shape). ***E.g. Chlamydomonas.***

• ***Anisogamy:*** Fusion of morphologically dissimilar gametes (different size and shape). ***E.g. Some algae, fungi.***

• ***Oogamy:*** A type of anisogamy where large, non-motile egg fuses with small, motile sperm. ***E.g. humans***

Pollination

• Pollination is the process where pollen, containing a plant's male reproductive cells, is transferred to the female part of a plant (stigma). This transfer is essential for plant reproduction, leading to fertilization and the development of seeds.

Types of Pollination:

1. ***Self-Pollination (Autogamy)***

• Pollen from anther is transferred to the *stigma of the same flower or another flower* on the *same plant*.

• No genetic variation. ***E.g. Pea, tomato.***

2. ***Cross-Pollination (Allogamy)***

• Pollen is transferred from the *anther of one flower to the stigma of another flower* on a *different plant of the same species.*

• Promotes genetic diversity. ***E.g. Apple, sunflower.***

Agent	*Type of Pollination*	*Examples*
Insect	Entomophily	Rose, Lotus
Wind	Anemophily	Maize, Grass
Water	Hydrophily	Vallisneria

• After pollination, the pollen grain germinates on the stigma and forms a pollen tube that carries the male gamete to the ovule in the ovary.

• Male and female gametes fuse to form the *Zygote*. Zygote develops into an *embryo*. The *ovule* becomes *seed* and *ovary* becomes *fruit*.

Specific Terms Associated

False Fruit

• A fruit that develops from *other parts of a flower, in addition to ovary,* and does not require fertilisation. In this type of fertilization, thallus is also involved. ***E.g. Apple, cashew nut.***

Parthenocarpic Fruits

• They are seedless fruits, that develops *without fertilisation of an ovule*. ***E.g. Banana, grape, cucumber.***

Drupe Fruit

• It is a type of fruit with a *hard shell that includes a seed* and has an inner flesh. ***E.g. Coconut.***

HUMAN REPRODUCTIVE SYSTEM

Parts of Male Reproductive System

1. *Testes*

• It is located in the *scrotum* (a sac outside the body to keep sperm cool).

• It produces *sperm* and *testosterone* (male sex hormone).

• Sperm production in males typically begin around the age of *10-12 yrs*.

2. *Vas Deferens (Sperm Duct)*

• Tube that transports *mature sperm* from epididymis to urethra.

3. *Seminal Vesicles and Prostate Gland*

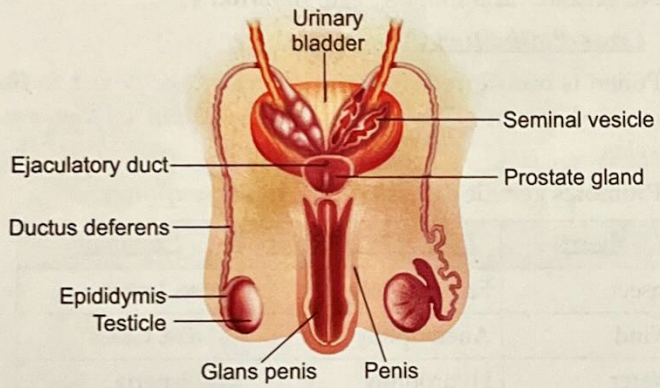
• It adds *seminal fluid* to sperm to form *semen*.

• Semen provides nutrients and a medium for sperm to swim.

4. *Urethra*

• It carries semen and urine, but never at the same time.

• It passes through the penis and exits the body.



Male Reproductive System

Parts of Female Reproductive System

1. *Ovaries (primary sex organ in females)*

• Ovaries produce eggs (ova) and *estrogen + progesterone* (female sex hormones).

• A female is born with *all the egg cells* (oocytes) she will ever have. At the age of *12*, the ovaries start to mature.

2. *Fallopian Tubes (Oviducts)*

• The site where sperm meet egg and fertilization occurs. The cilia inside the fallopian tubes push the egg towards the uterus.

• **Parts of fallopian tube:**

– The fimbriated infundibulum captures the egg.

– The ampulla- site of fertilization.

– Isthmus

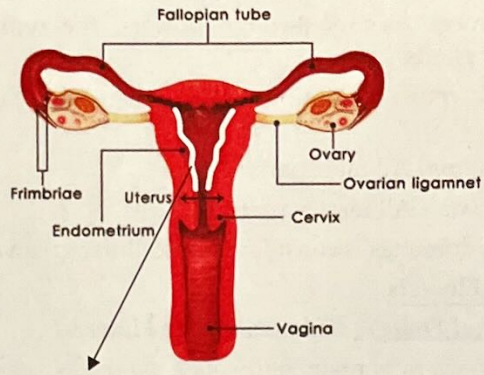
– Intramural- part within the uterus wall.

3. *Uterus (Womb)*

• Muscular organ where a fertilized egg implants and develops into a foetus. The innermost lining of the uterus is called *endometrium*.

4. *Cervix*

• The cervix is the lower part of the uterus that connects to the vagina. During childbirth, it must *open to allow the baby to pass through*.



Thickening of uterine wall for preparation for potential implantation of fertilised egg during pregnancy. When pregnancy does not occur after the uterine lining thickens, the lining is shed through *menstruation*.

Female Reproductive System

Cervical cancer is caused by: HPV (Human Papilloma Virus).

Menopause

• Menopause is the *permanent cessation of menstruation* in women, marking the end of their reproductive years. It typically occurs in the *late 40s to early 50s*, with the average age being around 51. This stage is characterized by the *ovaries no longer releasing eggs* and a decrease in the production of *estrogen* and *progesterone*.

Fertilization

• Fertilization is the process where a male gamete (sperm) and a female gamete (egg) fuse to form a *zygote*, which is the first cell of a new individual.

Types of Fertilisation :

1. *Internal Fertilisation:* The process of a sperm cell and an egg cell fusing *inside the female body* during reproduction. *E.g. in humans.*
2. *External Fertilisation:* A reproductive process where a male sperm fertilises a female's egg *outside of the female's body*. *E.g. Frog, earthworms, crab.*

• *Viviparous:* Animals that *develop inside the parent's body* and give birth to live offspring. *E.g. Cats, dogs, humans.*

• *Ovoviviparous:* Animals that *lay eggs and the eggs develop inside mother's body*. *E.g. Sharks, snakes, some fishes (like guppies).*

• *Oviparous:* Animals that *lay eggs and the eggs develop outside the mother's body*. *E.g. Birds, frogs, lizards, (Exception: Platypus is the only mammal reproduced oviparously).*

Process of Fertilization

Process involved:

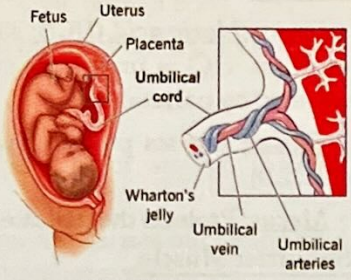
1. *Gametogenesis:* This is the process of forming gametes → Sperm in males and eggs in females, essential for reproduction.

2. ***Insemination:*** It involves the transfer of sperm into the female reproductive tract during intercourse.
3. ***Fertilisation:*** The sperm meets and fuses with the egg, forming a zygote (the first cell of the new baby).
4. ***Implantation:*** The zygote develops into a blastocyst and attaches itself to the uterine wall, beginning pregnancy.
5. ***Gestation:*** This is the period of development where the embryo grows and forms into a foetus inside the uterus.
6. ***Parturition:*** The final stage, where the baby is delivered through childbirth.

Role of Arteries and Veins in Pregnancy

During pregnancy:

• Arteries in the uterus (especially the spiral arteries) supply ***oxygen-rich blood*** and nutrients to the ***placenta, supporting the growing fetus.***



Umbilical cord

• Veins carry ***deoxygenated blood*** and waste products from the ***placenta back to the mother's*** circulation for disposal.

Different methods of avoiding pregnency:

• ***Barrier method:*** Using condoms.

• ***Natural:*** Periodic abstinence

• ***IUD (Intrauterine device) method:*** Inserting copper T

• ***Hormonal:*** Taking oral pills.

• ***Surgical method:*** Tubectomy for women and Vasectomy for men.

Totipotency

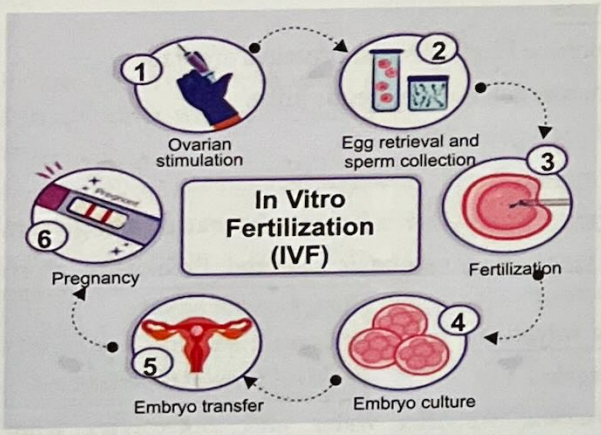
• It is the ability of a single cell to produce a fertile, adult individual.

Parthenogenesis

• A type of asexual reproduction, where an ***organism develops from an unfertilised egg***, without the need for sperm. The unfertilised egg completely develops into a new organism. ***E.g. Honey bees, lizards.***

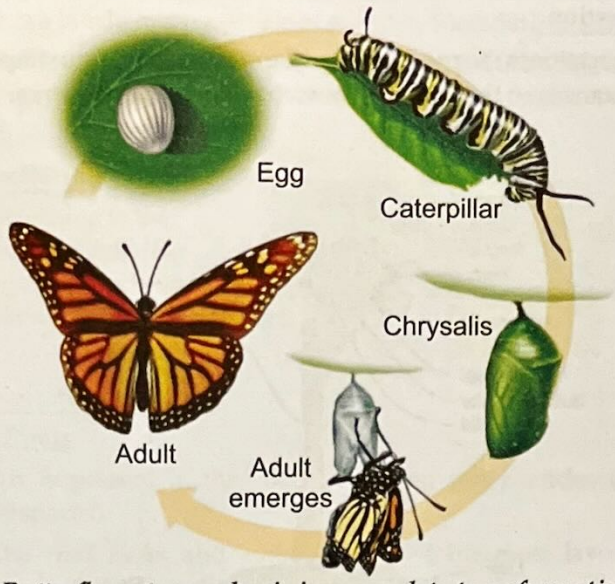
In-Vitro Fertilisation *(IVF)*

• In in-vitro fertilisation (IVF), an egg is combined with a sperm ***outside the mother's body***, in a laboratory setting.



In-Vitro Fertilization Process

Metamorphosis in Butterfly



Butterfly metamorphosis is a complete transformation involving four distinct stages: Egg, larva (caterpillar), pupa (chrysalis), and adult butterfly.

Metamorphosis of a Larva into an Adult

Types of Culture

Types	*Culture*
Vegetable farming	Horticulture
Silk rearing	Sericulture
Bee keeping	Apiculture
Fish farming	Pisciculture
Flower farming	Floriculture
Rearing aquatic plants and animals	Aquaculture
Cultivation of grapevines	Viticulture / Viniculture
Bird farming	Aviculture

Some points to know:

• The transformation of the larva into an adult through drastic change is called ***metamorphosis.***

• In honey bees, males are haploid and females are diploid.

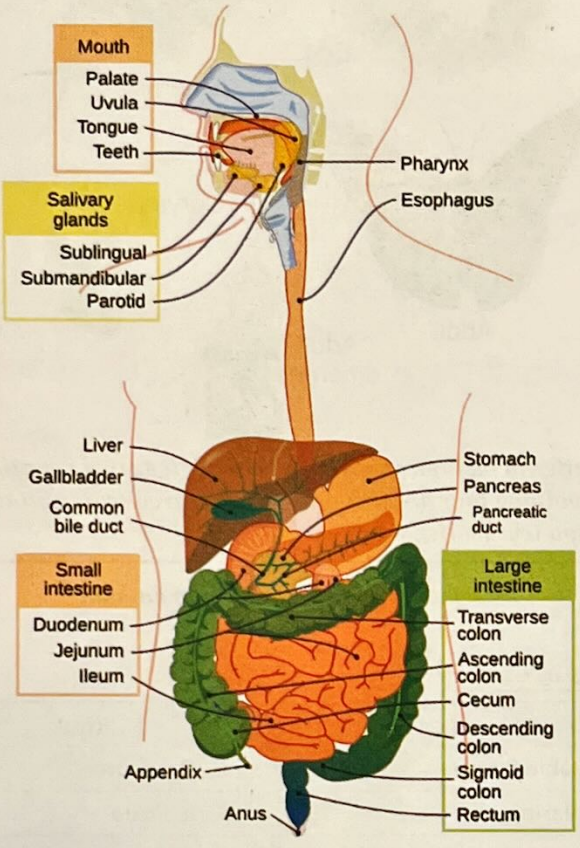
• Snails can change their gender during their lifespan.

• ***Lampbrush chromosomes*** are involved in the production of 'masked' mRNAs for early development.

DIGESTIVE SYSTEM

Digestion

• Digestion is the process of breaking down food into simpler substances so the body can absorb and use the nutrients.



Overview of Digestive System

Anabolic - building process
Catabolic- break down process

Main Organs of Digestive System

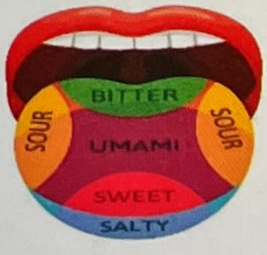
Mouth *(Oral Cavity)/Buccal Cavity)*

• Digestion starts here. Teeth chew the food (mechanical digestion).

• Saliva (from salivary glands) contains *salivary amylase*, which breaks down *starch* (complex carbohydrates to simple carbohydrates).

• Tongue helps in mixing food and swallowing.

• An antibacterial enzyme present in saliva and tears is called ***lysozyme.***



Roughage/dietary fibres aids digestion and prevents constipation.

Pharynx and Oesophagus

• Pharynx connects *mouth to esophagus*.

• Oesophagus (length: *25 cm*) is a muscular tube that pushes food to the stomach through peristalsis (wave-like movement).

Stomach

• *J-shaped* muscular organ.

Secretes:

• ***Hydrochloric acid (HCl):*** Kills germs and provides acidic medium. HCl is present in *gastric juice* (pH: 1.6). HCL is secreted by **parietal cells.**

• ***Pepsin:*** Digests proteins (works in acidic medium only) (pH: 2.0).

• ***Mucus:*** Protects the delicate stomach lining from acid.

Sphincter Muscle

• It allows food to pass from stomach to small intestine.

Small Intestine

• It is the longest part of the *alimentary canal* (6.5 to 7.5 meters). It is the main site of *digestion* and *absorption*.

• It is divided into three parts: *duodenum, jejunum, ileum*.

Digestive Juices Received in Small Intestines from Liver

Bile (bile juice)

• Bile juice is stored in *gall bladder* and released by *liver*.

• Bile is not an enzyme but plays a crucial supporting role in digestion.

Function of Bile:

• Bile is *alkaline* (basic) in nature.

• It neutralizes the acidic food before it enters the small intestine.

• This creates a favorable pH for the action of pancreatic and intestinal enzymes.

Maltase enzyme in small intestine converts Maltose to Glucose.

Emulsification of Eats:

• Bile breaks down large *fat globules* into *smaller globules*. This process is called *emulsification*.

Pancreas

• ***Function:*** Digests carbs, proteins, and fats.

• Pancreas release pancreatic juice:

• pH of trypsin- 7.9

→ ***Amylase:*** Breaks down carbs.

→ ***Lipase:*** Breaks down fats into fatty acids and glycerol.

→ ***Trypsin (works in basic medium):*** Breaks down proteins into *amino acids*.

Roughage found in:
- *Green leafy vegetables, Fruits, etc.*
- *Fibre: Promotes peristalsis*

Large Intestine

• ***Length:*** *1.5 m.*

• ***Function:*** Absorbs water and electrolytes from the

remaining undigested food, solidifying it into feces for elimination.

• ***Large intestine comprises of:***

→ ***Cecum:*** First part of the large intestine, and it connects the small intestine to the colon.

→ ***Colon:*** Responsible for absorbing water from indigestible food residues.

Liver

• The study of the liver is called *Hepatology*.

• The liver is the *largest gland* in the human body.

• It is located on the right side of the abdomen and is *dark red-brown* in color.

Functions of the Liver:

• It converts *glucose* into *glycogen* for storage (process known as glycogenesis).

• It synthesizes plasma proteins and carries out amino-acid metabolism (deamination and urea formation).

• It stores *glycogen* in liver cells to maintain blood sugar levels.

Mode of nutrition:
Ingestion— digestion— absorption— assimilation— egestion

Important Liver Cells:

1. ***Kupffer Cells***

• *Star-shaped phagocytic cells* found in the lining of liver sinusoids.

Functions:

• They are involved in the breakdown of *RBCs*.

• They clean pathogens and debris from the blood.

• Kupffer cells have *regenerative* ability.

2. ***Hepatocytes***

• The main *parenchymal* (functional) cells of the liver.

• Perform various cellular functions, Esophagus, including:

Metabolism of carbohydrates, proteins, and fats and detoxification of blood.

Villi

• Villi are *finger-like projections* found in the inner wall of the small intestine.

• They significantly *increase the surface area* of the intestinal lining, enhancing nutrient absorption (assimilation).

Rectum and Anus

• Rectum stores feces.

• Anus is the opening through which waste is excreted from the body.

Mouth
↓
Pharynx
↓
Esophagus
↓
Stomach
↓
Small Intestine
- *Duodenum*
- *Jejunum*
- *Ileum*

↓
Large Intestine
- *Cecum*
- *Colon*
- *Rectum*

↓
Anus

Alimentary Canal Flowchart

RESPIRATION

• It is a biochemical process of enzyme, including oxidative breakdown of organic compounds inside living cells, releasing energy in the form of ATP (Adenosine Triphosphate).

Breathing

• Breathing is the process of *inhaling oxygen* and *exhaling carbon dioxide* by the lungs.

Guttation: Water loss in plants during night through hydathodes present in leaf edges.

Respiration in Plants

By Roots

• Air is present in the spaces between soil particles (soil interspaces).

• The *root hairs* and *epiblema cells* (outermost layer of young roots) are in direct contact with this soil air.

• Oxygen from the air in the soil diffuses through the root hairs and epiblema cells into the inner tissues of the root.

• This oxygen is then used in aerobic respiration by root cells to break down *glucose* and *release energy*.

By Leaves

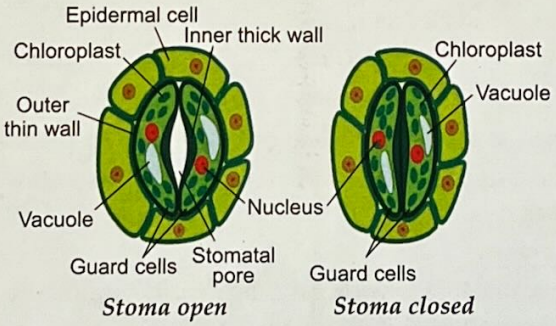
• Leaves and young stems are well-suited for the quick exchange of *gases* due to their thin structure and presence of pores.

• Stems, especially mature ones, are covered by an impermeable epidermis to prevent water loss. This outer layer helps in *conserving moisture*.

• The epidermis of leaves contains tiny openings called *stomata*.

• Each stoma is bordered by two specialized cells known as *guard cells*.

• Guard cells control the *opening* and *closing of stomata*, regulating gas exchange and *water loss* (transpiration).

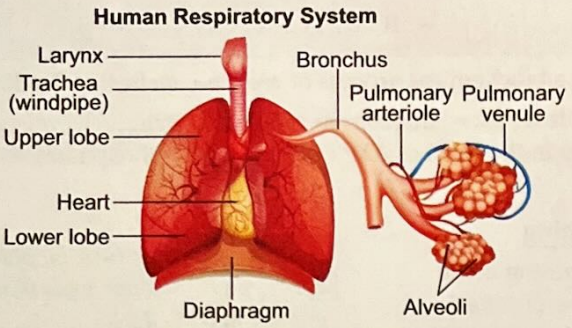


Stoma open *Stoma closed*

Respiration in Animals

Mechanism of Respiration

• *Nose → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli.*



The Respiratory System

Pleura: Outer covering of lungs

Nose

- First entry point for air into the respiratory system.
- Hair inside the nose traps dust and impurities, allowing *only filtered air* to pass through.
- Mucus lining inside the nose moistens the air, traps dust particles and bacteria. It also helps in cleaning and protecting respiratory tract.

Diaphragm: Forms the floor of the chest cavity

Pharynx

- A common passage for both *air* and *food*.
- It connects the *nasal cavity* to the larynx.
- It ensures air is directed towards the *windpipe* (trachea).

Respiration centre is in Medulla Oblongata.

- It also known as the *Adam's Apple*.
- It contains vocal cords, which produce sound when air passes through them.
- It is located at the *top of the trachea*.

Trachea *(Windpipe)*

- A long tube that carries air from the larynx to the bronchi.
- Surrounded by *C-shaped cartilage rings* that prevents the trachea from collapsing during inhalation and keeps the airway open at all times.

Bronchi *(Singular: Bronchus)*

- The trachea divides into *two bronchi* → one for each lung.
- Each bronchus enters a lung and carries air deeper inside.
- Bronchi also contain *mucus* and *cilia* to trap dust and microbes.

Bronchioles

- Inside the lungs, each bronchus further branches into smaller tubes called *bronchioles*.
- These are narrower and more numerous, spreading air throughout the lungs.
- Bronchioles lead directly to the *air sacs (alveoli)*.

Alveoli *(Air Sacs)*

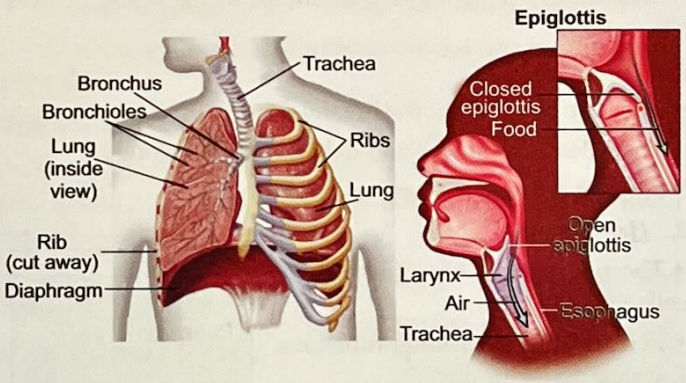
- Tiny *balloon-like structures* present at the ends of bronchioles.
- The lungs contain millions of alveoli that are surrounded by *capillaries* (tiny blood vessels).
- ***Emphysema:*** Inner walls of alveoli become damaged, causing them to eventually burst.

Functions:

- *Exchange of gases* occurs here, oxygen from the air diffuses into the blood and carbon dioxide from the blood diffuses into the alveoli to be exhaled.
- Their thin walls and large surface area make gas exchange very efficient.

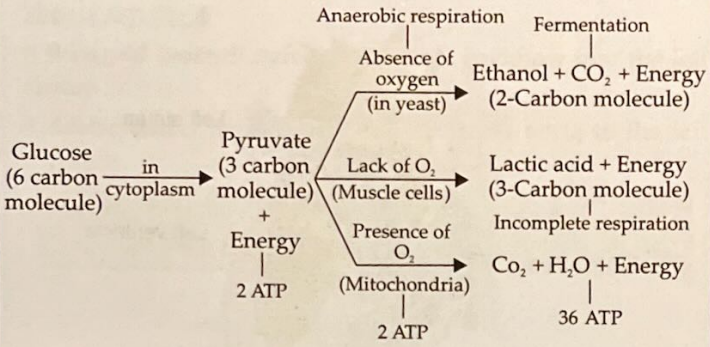
Inhale	*Exhale*
Rib cage goes up	Rib cage goes down
Diaphragm goes down	Diaphragm goes up
Lung expands	Lung contract
% of gases: O_2: 21% CO_2: 0.04%	*% of gases:* O_2: 16.4% CO_2: 4.4%

Epiglottis: It protects our airway and prevents food and liquid from entering our lungs while we swallow.



Aerobic Vs Anaerobic Respiration

Aerobic Respiration	*Anaerobic Respiration*
It requires molecular oxygen	It does not require molecular oxygen
It occurs in mitochondria and cytoplasm	It occurs in cytoplasm
The end products are CO_2 and H_2O and energy	The end products are CO_2 and C_2H_5OH (ethanol) and energy
Large amount of energy is released during this process	Small amount of energy is released during this process
During aerobic respiration, 38 ATP molecules are generated	During aerobic respiration, only 2 ATP molecules are generated



- *Yeast is used in dough to make baked goods. It makes the dough soft and fluffy.*
- *Accumulation of lactic acid in the muscles causes cramps.*

Cellular Respiration

- Cellular respiration is the process by which cells break down *glucose* (sugar) in the presence of oxygen to release energy in the form of *ATP* (Adenosine Triphosphate).

Overall Reaction

Glucose ($C_6H_{12}O_6$) + Oxygen 6(O_2) → Carbon dioxide 6(CO_2) + Water 6(H_2O) + Energy (ATP)

Steps in Cellular Respiration

1. **Glycolysis** *(in the cytoplasm)*

- Glucose (6C) is broken down into *2 molecules of pyruvate* (3C each).
- In this process a small amount of *ATP* and *NADH* is produced.

2. **Krebs Cycle** *(Citric Acid Cycle) (in mitochondria)*

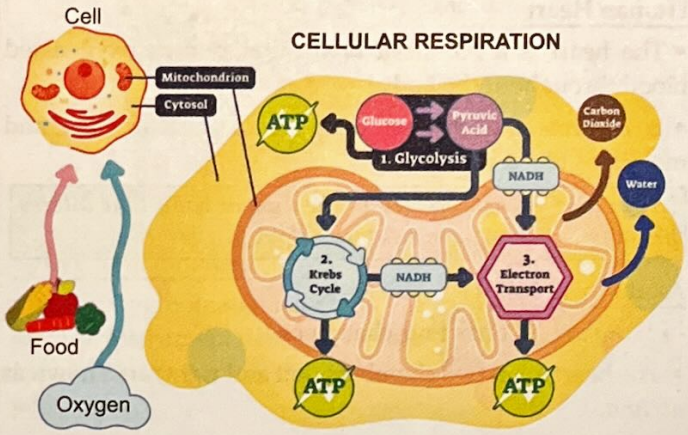
- Pyruvate is further broken down.
- CO_2 is released, and energy carriers *NADH* and $FADH_2$ are produced.
- The process occurs in the matrix of mitochondria.

3. **Electron Transport Chain** *(ETC) (in the inner mitochondrial membrane)*

- NADH and $FADH_2$ donate electrons.
- *Oxygen* acts as the final electron acceptor.
- Large amounts of ATP are produced (up to *34 ATP*).

Nicotinamide adenine dinucleotide (NADH) is a coenzyme that plays a vital role in cellular respiration by transporting electrons to the Electron Transport Chain.

→ About *38 ATP* molecules are produced per molecule of glucose during aerobic respiration.



Cellular Respiration Process

Some important points to know:

- Electron acceptor in aerobic respiration is oxygen.
- The electron transport chain is present on the inner mitochondrial membrane, where oxidative phosphorylation produces ATP.
- Aquatic organisms breathe faster than terrestrial organisms because the amount of oxygen dissolved in water is very low.
- The enzymes which catalyse the same reaction but have different amino acid composition are commonly known as *isoenzymes*.
- ***Lysine*** is an amino acid which is considered essential in human diet.
- The biological catalysts which help in the breakdown of food in humans known as enzymes.
- During indigestion, the stomach produces too much acid that may be neutralized by an Antacid such as Magnesium Hydroxide or Magnesium Carbonate.
- ***Histamine*** stimulates acid secretion in the stomach.
- ***Spirometer*** is used to measure lung volumes during breathing.
- In ruminants like cattle, bacteria present in rumen helps in digestion of cellulose.

CIRCULATORY SYSTEM

Human Heart

• The heart is a *fist-sized organ* that pumps oxygenated blood throughout the body.

• It controls the rhythm and speed of heart rate and maintains blood pressure.

Nitric oxide is synthesized in the human body that dilates blood vessels and increases blood flow.

Anatomy of Heart

→ Human heart has four chambers:

• The heart's top two chambers (left and right) are known as *atrium*.

• The heart's bottom two chambers (left and right) are known as *ventricles*.

→ *The wall of the heart comprises three layers:*

• The heart wall's *outer layer* is known as the *epicardium*.

• The heart wall's *middle layer* is known as the *myocardium*.

• The heart wall's *inner layer* is known as the *endocardium*.

Heart Beat

• The rhythmic contraction and relaxation of the heart, which includes one *systole* (ventricular contraction) and one *diastole* (ventricular relaxation) of the heart.

• Heart beat count of healthy person is *72 times per minute*.

• Sound of heart: *Lub-Dub*.

- *Lub:* The sound of the *mitral* and *tricuspid valves closing*.
- *Dub:* The sound of the *aortic* and *pulmonary valves closing*.

Cardiac Output

• The amount of blood pumped by *heart per minute* is called cardiac or heart output. The value of cardiac output of a normal person is about *72 bpm × 70 mL per beat = 5040 mL* or about *5L per minute*.

Electrocardiogram (ECG)

• An electrocardiogram (ECG) is a test that records the *electrical activity of the heart*. It produces a graph of voltage versus time using electrodes placed on the skin. This graph helps in detecting abnormal heart rhythms and conditions related to heart function.

A stethoscope is used as an instrument to measure heartbeat.

Structure and Function of Heart

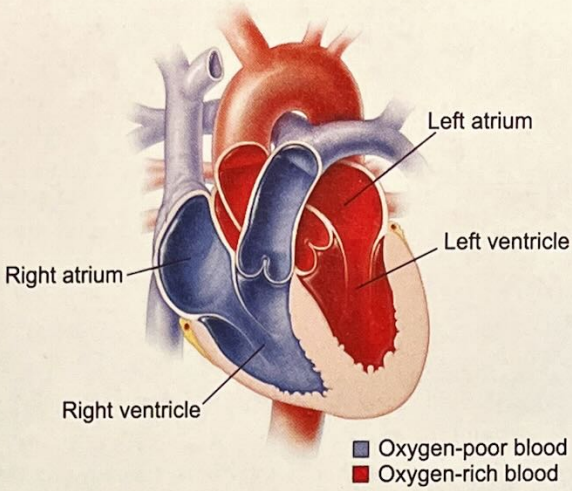
1. Right Atrium

• **Location:** Upper right side, of the heart.

• **Function:** It receives *deoxygenated blood* from different parts of body through:

→ ***Superior vena cava*** (from upper body)

→ ***Inferior vena cava*** (from lower body)



Chambers of Heart

• Oxygenated blood is usually carried by *arteries*, which are thick-walled and carry blood from the heart to different parts of the body through high pressure.

→ ***Exception: The pulmonary artery carries deoxygenated blood from the heart to the lungs.***

• Deoxygenated blood is usually carried by *veins*, which carry blood from different parts of the body back to the heart.

→ ***Exception: The pulmonary vein carries oxygenated blood from the lungs to the heart.***

• Blood passes into the right ventricle through the tricuspid valve.

Varicose veins: Swollen blush veins resulting from the valves that do not close properly.

2. Right Ventricle

• **Location:** Lower right side of the heart.

• **Function:** It receives blood from the right atrium.

• Pumps *deoxygenated blood* to the lungs via the *pulmonary artery*.

Valves Involved:

• ***Tricuspid valve:*** It prevents backflow into the right atrium.

• ***Pulmonary valve:*** It controls flow from right ventricle to pulmonary artery.

3. Left Atrium

• **Location:** Upper left side of the heart.

• **Function:** It receives *oxygenated blood* from the lungs through four *pulmanary veins*.

• Blood flows from the left atrium into the left ventricle through bicuspid (mitral) valve.

4. Left Ventricle

• **Location:** Lower left side of the heart.

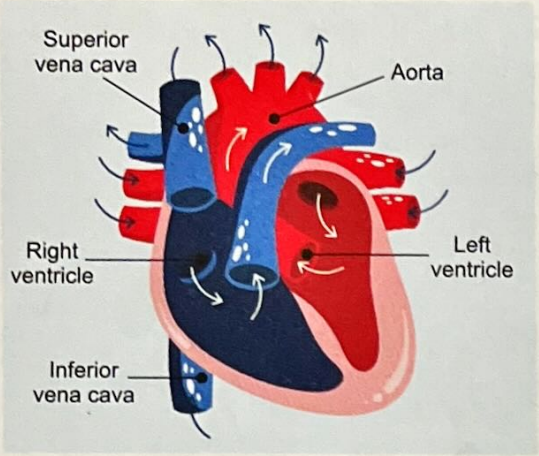
• It is the *thickest chamber* of the heart.

• **Function:** It receives *oxygen-rich blood* from the *left atrium* and pumps blood into the *aorta*, which supplies it to the entire body.

Valves Involved:

- ***Bicuspid (mitral) valve:*** It prevents backflow into the left atrium.
- ***Aortic valve:*** It prevents backflow from aorta to the left ventricle.

> - *Aorta: It is the largest artery in human body.*
> - *Inferior Vena Cava: It is the largest vein in human body.*



Arteries and Veins of Heart

> *Blood circulation was discovered by William Harvey.*

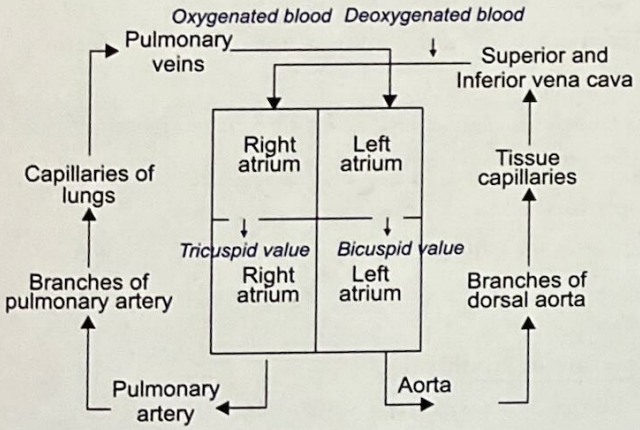
Double Circulation

- Double circulation is the type of blood circulation in humans (and all mammals) where the *blood passes through the heart twice* during one complete cycle around the body.

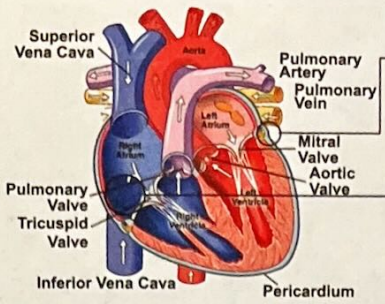
E.g.

(i) The blood pumped by the right ventricle (deoxygenated blood) is transported through pulmonary artery to lungs where *CO_2 is exchanged with O_2* through diffusion and returns back to the heart through *pulmonary vein*.

(ii) The oxygenated blood from left ventricle is transported through *aorta* to different body parts (cells and tissues) where *O_2 is exchanged with CO_2* through diffusion and then returned back to the heart through *vena-cava*.



Double Circulation of Blood



Coronary Artery: The main blood vessel that supply oxygen rich blood to heart muscles.

Sinoatrial Node: It act as heart's natural pacemaker, it generates electrical signals that causes heart's upper chamber to contract.

Sphygmomanometer

> *Canadian electrical engineer John Hopps invented the first pacemaker in 1950.*

- A sphygmomanometer is a medical instrument used to measure *blood pressure*.

It Measures:

- ***Systolic Pressure:*** The heart *contracts* and *pumps blood out* of the body (normal: *~120 mm of Hg*).
- ***Diastolic Pressure:*** The heart *relaxes* and *fills with blood* to prepare for the next beat (normal: *~80 mm of Hg*).

Pulse Rate

- The number of times your heart beats per minute.
- Normal range: *60-100 beats per minute*.

Blood

> *pH of human blood is: 7.4*

- Blood is a special connective tissue that consists of fluid matrix (plasma), and solid components (blood cells).
- There are three main types of blood cells: *RBC (Red blood cells), WBC (White blood cells),* and *Platelets*.

RBC (Red Blood Cells)/Erythrocytes

- ***Structure:*** Red in colour, circular and biconcave in shape, denucleated, elastic, lack of cell organelles like ER, ribosomes, mitochondria etc.
- Normal range of RBC count in human blood: *4.5 to 5.5 million per cubic millimetre*.
- ***Formed in:*** Bone marrow (from birth) having a lifespan of *about 120 days*.
- ***Function:*** Transport of oxygen and some amount of CO_2.
- ***Graveyard of RBC:*** *Spleen* (a large bean-shaped lymphoid organ).

WBC (White Blood Cells)/Leukocytes

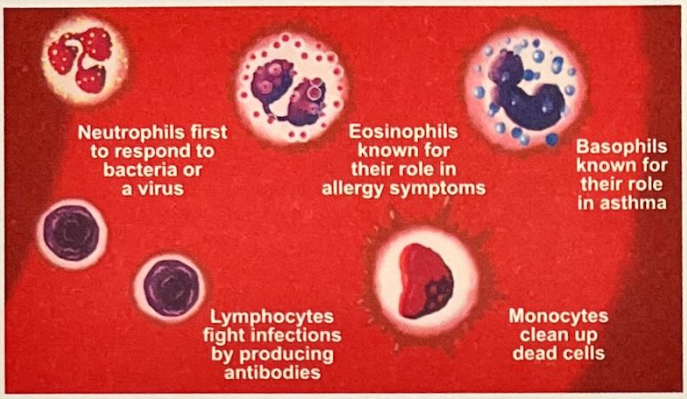
- Normal range of WBC count in human blood: *5000-8000 per cubic millimetre*.

> *Low blood count causes Anemia.*

> *Leukemia is a type of blood cancer that affects blood cells in bone marrow usually WBCs.*

Plasma

- The *liquid part of blood* or *lymph* which is yellow coloured, viscous fluid and contains about *90-92%* of water and *6-8%* proteins.



Types of WBC Cells

Blood Group

• The four main blood groups *(A, B, AB, and O)* were discovered by Austrian scientist *Karl Landsteiner* in *1900*. He identified the *O*, *A*, and *B* blood types, which led to the understanding of the *ABO* blood group system.

• Bombay Blood Group was discovered by *Y. M. Bhende* in *1952*.

	Group A	Group B	Group AB	Group O
Red blood cell type	A	B	AB	AB
Antibodies in plasma	Anti-B	Anti-A	None	Anti-A and Anti-B
Antigens in red blood cell	A antigen	B antigen	A and B antigens	None

Universal donor: O–
Universal acceptor: AB+

Blood Types	Gives	Receives
A+	A+, AB+	A+, A–, O+, O–
O+	O+, A+, B+, AB+	O+, O–
B+	B+, AB+	B+, B–, O+, O–
AB+	AB+	Everyone
A–	A+, A–, AB+, AB–	A–, O–
O–	Everyone	O–
B–	B+, B–, AB+, AB–	B–, O–
AB–	AB+, AB–	AB–, A–, B–, O–

• Some facts regarding human antibodies:

- IgG constitutes the largest portion of antibodies.
- IgE plays a key role in allergic responses.
- IgA is primarily located in bodily secretions such as saliva and breast milk.
- IgM immunoglobulin is the first to be produced in response to an infection.

Rh Factor

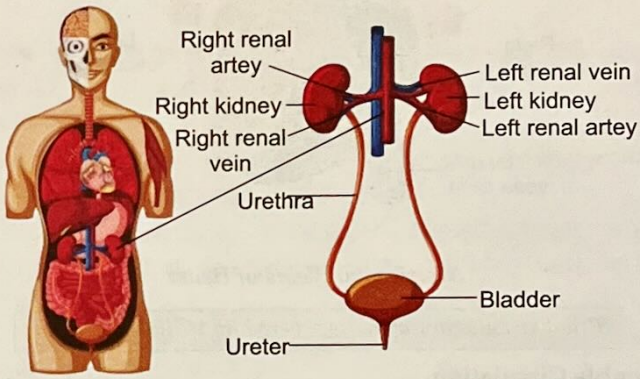
• The Rh factor *(Rhesus factor)* is an inherited protein found on the surface of red blood cells. The name "Rh" comes from the *rhesus* monkey, whose red blood cells were first used in research to detect this antigen in humans.

• If a person has the Rh protein, they are said to be *Rh-positive (Rh+)*. If they lack the Rh protein, they are *Rh-negative (Rh–)*.

EXCRETORY SYSTEM

• The excretory system is responsible for removing waste products from the body to maintain internal chemical balance (homeostasis). The main waste product removed is urea, along with excess water and salts.

• The main organs of the human excretory system: *Kidneys (2), Ureters (2), Urinary Bladder and Urethra*.



Excretory System

Kidneys

• Size and structure: *10-12 cm* in length, *5-7 cm* in width, *2-3 cm* thick, and average weight is about *120-170 g*.

• It is a *bean-shaped organs* located on either side of the backbone, just below the ribcage.

• Right kidney is positioned *slightly lower* in comparison to left kidney (located on dorsal side).

• Main function: Filter blood to remove urea, excess salts, and water, forming urine.

• Each kidney contains about *1 million nephrons* (basic functional units).

• Outer layer of kidney: Renal cortex and Renal capsule.

• Hormones released by kidney: Erythropoietin (EPO), Renin and Calcitriol.

• Hepatic Portal Vein: Carries fluid like alcohol from small intestine to liver.

Nephrons

• It is a basic unit of Kidney.

• Nephrons remove waste material from blood, through ultrafiltration.

Structure of Nephron

→ ***Bowman's Capsule:*** *Cup-shaped* structure that encloses the glomerulus.

→ ***Glomerulus:*** A bunch of capillaries where blood is filtered. The filtration of blood in glomerulus, about *1100-1200 mL* of

blood is filtered by the kidney per minute.

→ ***PCT (Proximal convoluted tubule):*** Reabsorbs useful substances like glucose, water, and salts.

→ ***Collecting Duct:*** Collects urine and passes it to the renal pelvis. It eventually drain into the ***Renal pelvis***.

→ ***JGA (Juxtaglomerular Apparatus):*** Responsible for regulating ***blood pressure and glomerular filtration rate*** (GFR).

• The peritubular capillaries are primarily involved in reabsorption in the nephrons.

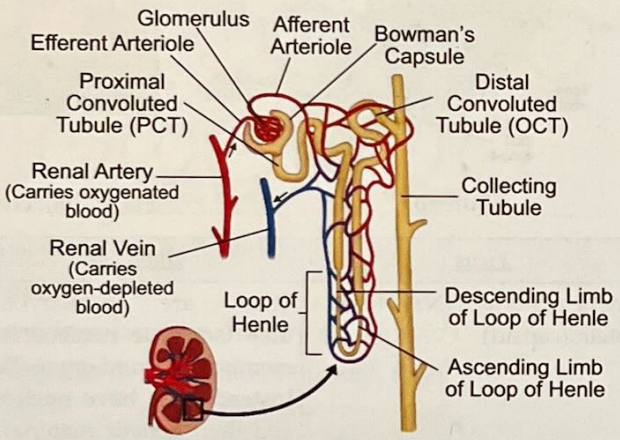
Processes in the Nephron

• ***Ultrafiltration:*** Blood pressure forces water and solutes into the Bowman's capsule.

• ***Reabsorption:*** Useful substances (like glucose and some water) are reabsorbed in the tubule.

• ***Secretion:*** Some extra wastes are actively secreted into the tubule.

• ***Excretion:*** Final urine is sent to the collecting duct.



Nephron Structure

Loop of henle

• The loop of Henle is most critical for generating the osmotic gradient that concentrates urine.

Ureters

• Two narrow tubes that carry urine from the kidneys to the urinary bladder.

Urinary Bladder

• It is a muscular sac that stores urine temporarily that can expand and contract.

• When urinary bladder is full, it sends signals to the brain to initiate urination.

Urethra

• It is a tube through which urine is excreted out of the body.

• It is controlled by a ***sphincter muscle*** that opens during urination.

Dialysis

• The procedure involves ***filtering of waste*** and ***excess fluid*** from the blood, when the kidneys are no longer functioning properly, the machine removes blood from body filters it through a ***dialyzer*** and returns the clean blood to the body.

Urea (NH_2CONH_2) was first synthesised by Friedrich Wohler in 1828 from simple inorganic compounds NH_4Cl and KNO.

Urine

• Urine components: ***Water*** (95%) and ***Urea*** (2%).

• pH: ***4.5-5***.

• Waste Product: ***Ammonia*** (Kidney converts ammonia into urea).

• The colour of urine is ***yellow*** → This colour comes from ***urochrome/urobilin***, a waste product that comes from breakdown of ***haemoglobin***.

Kidney Stone

• Kidney stones (made of ***Calcium Oxalate***) are hard deposit of minerals and acid salts that stick together in concentrated ***urine***.

• ***Main causes of kidney stones:*** Drinking less than 2L of water, obesity, eating food with too much salt and sugar.

• Bilirubin: An orange-yellow pigment formed in the liver by breakdown of haemoglobin and excreted in bile.

• The colour of solid waste from anus is yellow due to bilirubin.

Role of Other Organs in Excretion

• ***Lungs:*** It removes CO_2 (18L /day) and water.

• ***Liver:*** It secretes bile pigments like ***bilirubin*** and ***biliverdin***, which are by products of the breakdown of haemoglobin. These substances, along with cholesterol, certain drugs, and degraded steroids hormones are eliminated from the blood via bile.

• ***Sweat and sebaceous glands:*** The sweat glands of the skin help eliminate a small amount of ***urea, sodium chloride (NaCl), lactic acid*** through sweat. The sebaceous gland secrete sebum, an oily substance that helps eliminate certain lipid-based waste products, such as steroids, hydrocarbons, and waxes.

• ***Saliva:*** It can help to eliminate small amount of ***nitrogenous waste***.

Excretion in Animals

• ***Ammonotelism:*** The animals which excrete ***ammonia*** are called ammonotelic and excretion of ammonia is known as ***ammonotelism***. ***E.g. Amoeba, sycon, hydra, liver fluke, tapeworm, Leech, Prawn, bony fishes, etc.***

• ***Ureotelism:*** Excretion of ***urea*** is known as ureotelism and the animals which excrete urea are ***ureotelic animals***. ***E.g. Mammals, many terrestrial amphibians and marine fishes and sting rays, etc.***

• ***Uricotelism:*** Excretion of ***uric-acid*** is known as uricotelism and the animals which excrete uric-acids are called ***uricotelic***. ***E.g. Most insects, land snails, lizards, etc.***

DISEASES

• A disease can be defined as any disturbance in the internal structure and function of any organ or part of the body, which is usually associated with specific signs and symptoms.

• ***Father of Medicine: Hippocrates.***
• ***Father of Immunology: Edward Jenner, who is much famous for his contribution towards eradication of smallpox.***

Classification of Diseases on Basis of Time

Acute Diseases	*Chronic Diseases*
They last for a short period of time, cause major effects on health in a short time	They last for a longer period of time and takes a long time to cause major effects on health
E.g. Fever, cold, cough, etc.	***E.g. Diabetes, TB (tuberculosis), Elephantiasis, etc.***

Communicable and Non-Communicable Diseases

Communicable Diseases	*Non-Communicable Diseases*
These are diseases which spread from one person to another.	These are diseases which do not spread from one person to another.
They are caused by pathogens.	They are caused by deficiency of nutrients or due to some allergy or proliferation of abnormal cells.
E.g. Malaria, AIDS, TB, chicken pox, COVID, etc.	***E.g. Diabetes, arthritis, asthma, cancer, etc.***

Zoonotic Diseases: Spread from animals to humans.

Pathogens Responsible for Diseases

• Pathogens are disease-causing agents, that are responsible for ***causing infections*** and ***diseases in their hosts***, often by entering the body and causing physiological disruptions.

Pathogens include:

Virus:

• They are small infectious agents that ***need a host cell to replicate*** and cause diseases like the ***common cold, flu,*** and ***HIV***.

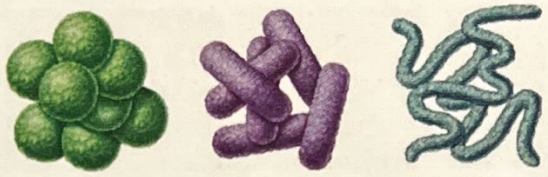
• In virus, the genetic material is included in a protein envelope known as ***Capsid***.

• Genetic material in viruses are made up of ***RNA*** (retrovirus with single stranded RNA) or ***DNA*** (with double stranded DNA).

• Antibiotics work against the formation of cell wall. Viruses are surrounded by a protective protein coating; they don't have cell walls that can be attacked by antibiotics like bacteria do.

Bacteria:

• They are ***single-celled organisms*** that can reproduce and cause diseases like ***pneumonia, strep throat,*** and ***food poisoning***.



(A) Coccus *(B) Bacillus* *(C) Spirillium*

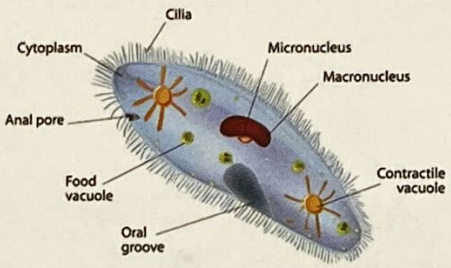
Types of Bacteria

Protozoa:

• They are one-celled organisms that can cause various diseases, including ***intestinal infections, amoebiasis, giardiasis, toxoplasmosis***. There often spread through contaminated water or by insect bites.

Fungus

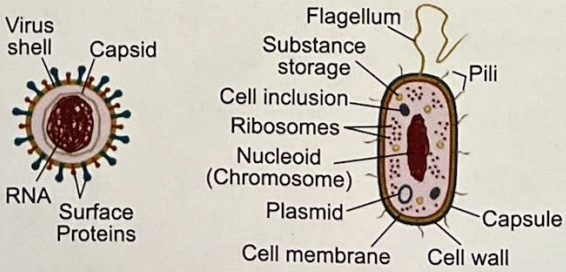
• A group of eukaryotic organism that can cause diseases like athlete's foot and yeast infections.



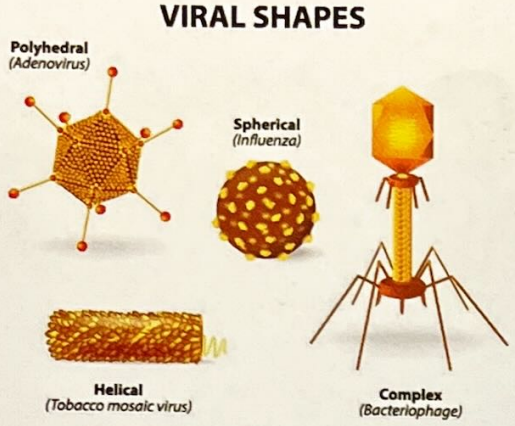
Protozoa

Fungal infection

Virus	*Bacteria*
Genetic material: DNA / RNA + Protein (capsid)	They are prokaryotes, they lack true nucleus and membrane bound organelles. Instead, they have nucleoid and their genetic material is called Genophore (bacterial DNA)
Non-living entity	Unicellular and living entity
It needs a host cell	It divides on its own
Parasitic in nature	Parasitic / Saprophytic in nature
Antibiotics cannot be used to treat viral infections	Antibiotics can be used to treat bacterial infections
Smaller (20-400nm)	Larger (1000nm)



Virus Vs Bacteria



Different Viral Shapes

DISEASES CAUSED BY VIRUS

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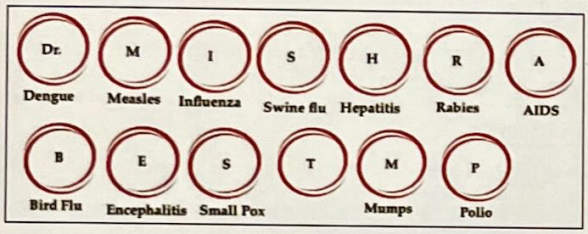
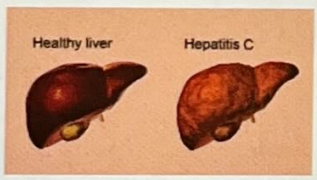


Hepatitis (Type A, B, and C)

- *Affects:* Liver.
- *Symptom:* Jaundice (mainly affects liver).

→ *Hepatitis A:* Transmitted through food.



Hepatitis affecting liver

→ *Hepatitis B:* Sexually transmitted affecting Liver through bodily fluids.

→ *Hepatitis C:* Transmitted when in contact with infected blood.

India's first indigenous Hepatitis-A vaccine: Havisure

Mumps

- It is a viral disease that affects the *parotid salivary glands* (cheek and jaw area).

Flu

- *Caused by: Influenza viruses → Types A, B, and C.*
- Influenza also known as *"evil influence of stars"*.

Common Cold

- *Caused by: Rhinovirus.*

Polio

Poliomyelitis

- *Caused by: Poliomyelitis/Polio virus.*
- Polio is totally eradicated from India, as declared in *2014*.
- It affects the nervous system, the nerves in *spinal cord* or *brain stem cells*.
- First polio vaccine was created by: *Dr. Jonas Salk.*
- India launched the *Pulse Polio Immunisation Programme on October 2, 1995.*

Cervical Cancer

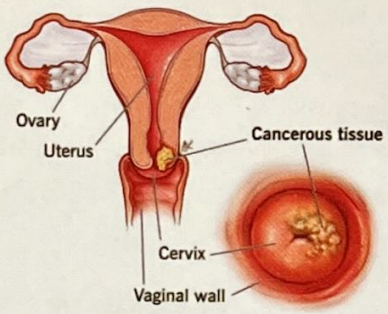
- *Caused by: Human Papillomavirus Causes (HPV).*
- It affects the cervix region in women.
- *Detected through: PAP Smear Test.*

Chicken Pox

- *Caused by: Varicella Zoster Virus.*

Small Pox

- *Caused by: Variola Virus.*
- *Vaccine by: Edward Jenner (1796).*
- Eradicated from India in: *1977.*



Cervical Cancer in Cervix Region

Dengue

- *Caused by: Flavivirus (DENV1-4).*
- *Carrier of virus: Aedes Aegypti mosquito* (also responsible for Chikungunya).

Rabies

- *Caused by: Lyssavirus.*
- In rabies, Central Nervous System (CNS) is affected which leads to hydrophobia.

AIDS (Acquired Immunodeficiency Syndrome)

- *Caused by: HIV (Human Immunodeficiency Virus* → retrovirus).
- 1st case of AIDS: 1981.

AIDS DAY is celebrated on: 1st Dec.

- It is a sexually-transmitted disease.
- *Death:* Due to weak immune system.
- *Method of transmission:* Sexual contact, blood transfusions, from mother to baby.
- *Test for detection: ELISA Test* **(Enzyme-linked Immunosorbent Assay).**

Encephalitis

- *Caused by: Herpes Simplex.*
- Inflammation in brain.

Swine flu

- *Caused by: H1N1.*

Bird flu

- *Caused by: H5N1.*

DISEASES CAUSED BY BACTERIA

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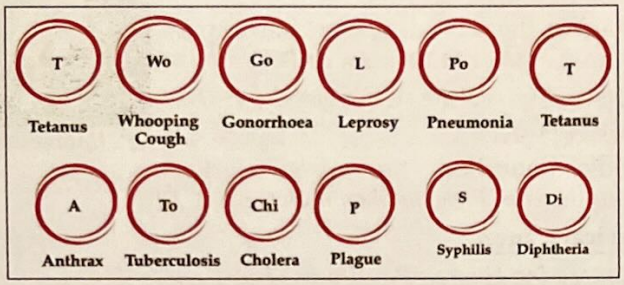


Plague

- *Caused by: Yersinia pestis.*
- Death due to plague known as: *Black Death.*
- *1897-1906:* 12 Million deaths in India was reported.

Leprosy

- *Caused by: Mycobacterium leprae.*
- Leprosy affects skin and is also known as *Hansen's Disease.*

Cholera

- *Caused by: Vibrio cholera.*
- It is a water borne disease. Death caused due to cholera is known as *"Blue Death".*

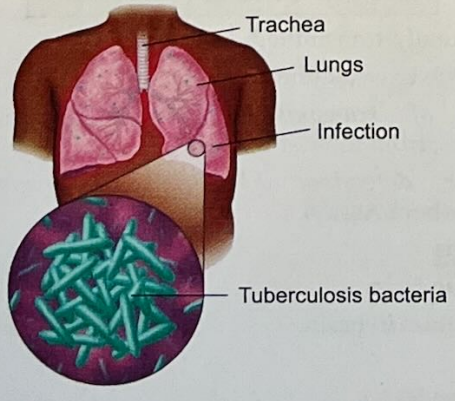
Cholera affecting small intestine

Bronchitis

- *Caused by: Bordetella pertussis.*
- It causes inflammation of the lining of bronchial tubes, which carry air to and affecting lungs.

TB (Tuberculosis)

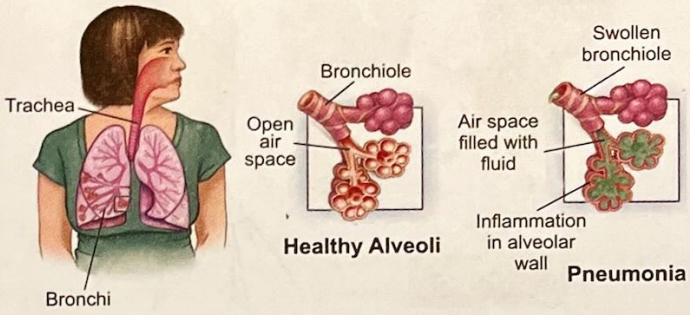
- *Caused by: Mycobacterium tuberculosis.*
- Vaccine provided against it: *BCG* (Bacillus Calmette-Guerin).



Tuberculosis affected lungs

Pneumonia

- *Caused by: Streptococcus pneumoniae.*



Pneumonia from the lungs.

Diphtheria

- *Caused by: Corynebacterium diphtheriae.*
- It affects the respiratory system (mucous membranes of nose and throat).

Diarrhoea

- *Caused by: E. Coli (Escherichia coli).*

E. Coli is a gram-negative facultative anaerobic, rod-shaped, coliform bacterium.

Peptic Ulcers

- *Caused by: Helicobacter pylori.*
- Robin Warren, along with Barry Marshal, was awarded the Nobel Prize in Physiology or Medicine in 2005 for the discovery.

Typhoid

- *Caused by: Salmonella typhi.*
- It affects small intestine (gut).
- Test to detect Typhoid: *Widal Test.*
- It is specifically confirmed by a serological method.

Acne

- *Caused by: Staphylococcus bacteria.*

Tetanus

- *Caused by: Clostridium tetani.*
- *Symptom:* locked jaw.

Whooping cough

- *Caused by: Bordetella Pertussis.*
- It gradually develops into pertussis.

Syphilis

- *Caused by: Treponema Pallidum.*
- Paul Ehrlich received the Nobel Prize for discovering the first chemotherapeutic agent, salvarsan in 1908, first successful treatment for syphilis.

Gram staining of bacteria

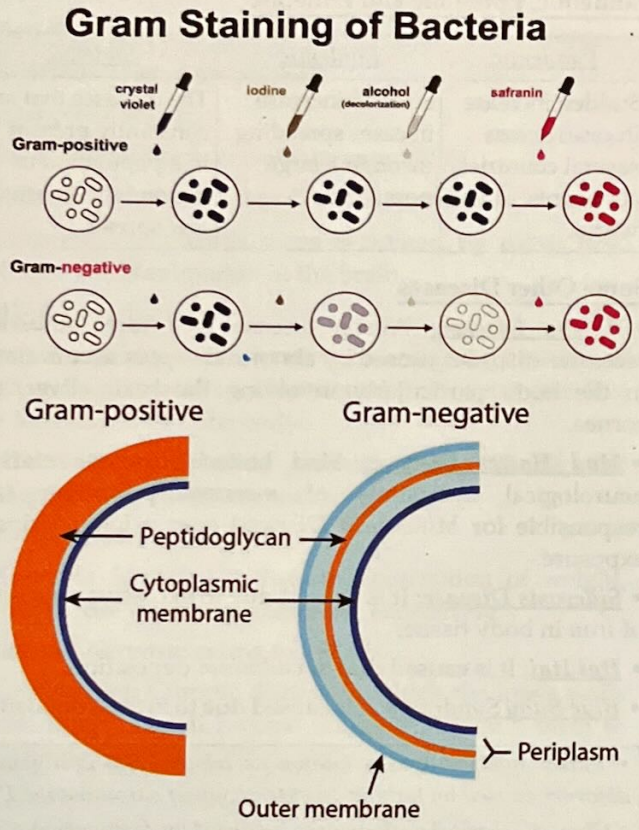
- Gram staining is a foundational differential staining technique used in microbiology to classify bacteria into Gram-positive (purple) or Gram-negative (pink/red) based on their cell wall structure. It involves a four-step process-

crystal violet, iodine, decolorizer (alcohol/acetone), and safranin-to identify bacterial types and guide clinical treatment.

- Gram negative bacteria are more resistant to Antibodies.
- Examples:

Gram-positive: Staphylococcus, Streptococcus, Bacillus

Gram-negative: Escherichia, Salmonella, Vibrio cholerae



DISEASES CAUSED BY FUNGUS

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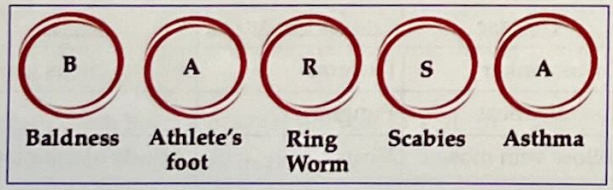


Baldness

- A fungal infection specifically *tinea capitis*, also known as *scalp ringworm*, can cause patchy hair loss.

Athlete's Foot

- A type of *ring worm* disease that affects the feet.

Ring Worm

- A common skin infection that can cause a red, itchy rash.

Scabies is a contagious skin disease caused by the parasitic mite Sarcoptes scabiei, characterized by intense itching and skin rashes.

Asthma

- Fungal exposure can be a significant trigger or contributor to asthma symptoms.

DISEASES CAUSED BY PROTOZOA

Malaria

Cinchona tree is found in Evergreen Forest.

- *Malaria Day: 25th April.*
- *Protozoa: Plasmodium.*
- Plasmodium falciparum is the deadliest species of Plasmodium that causes malaria in humans.
- Maturation and multiplication of merozoites of plasmodium inside the causes rupture in red blood cells.

Enlargement of Spleen and Liver due to Kala Azar Disease

- RBC rupture and toxin release every few days, is the property of plasmodium that makes malaria a cyclical disease with periodic fever.
- *Carrier:* Female *Anopheles* mosquito.
- *Treatment: Quinine* (found in bark of *cinchona tree*).

Sleeping Sickness

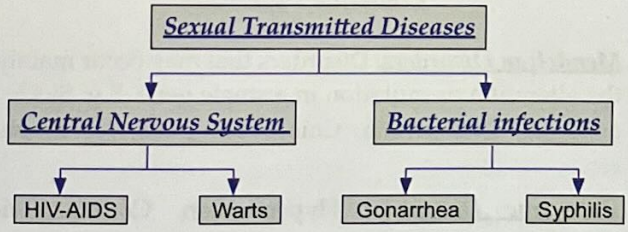
- *Protozoa: Trypanosoma.*
- *Carrier: Tse Tse fly.*

Kala Azar

- *Protozoa: Leishmania.*
- *Carrier: Sandfly.*

Water-borne Diseases	Air-borne Diseases
Hepatitis A	Influenza
Diarrhoea	Tuberculosis
Typhoid	Measles
Cholera	Pertussis
Giardiasis	Chickenpox
	Covid-19

GENETIC DISORDERS



1. *Chromosomal disorders:* Disorders in chromosomes.

- *Autosomal Disorders:* A genetic disorder that occurs when

a *gene on a non-sex chromosome is muted.*

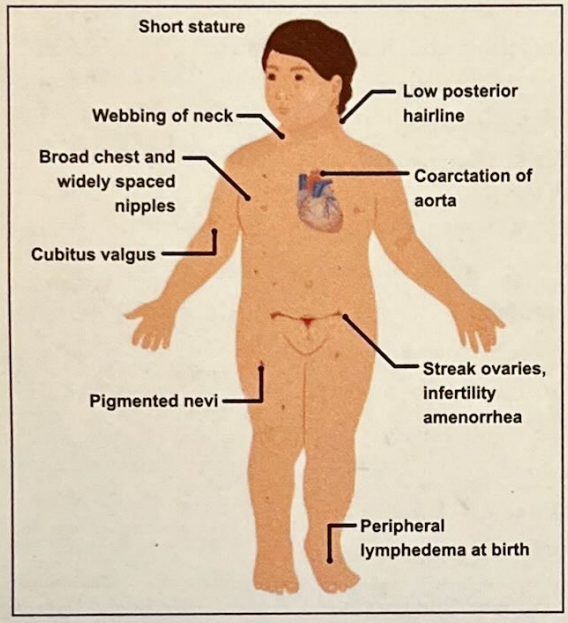
E.g. Down's syndrome: The person has an extra copy (or partial copy) of chromosome 21 *(Trisomy 21)* for a total of 47 chromosomes instead of 46; ***Albinism (the body makes little or no melanin).***

• ***Sex-Linked Disorders:*** Disorders that affect the *sex chromosomes.*

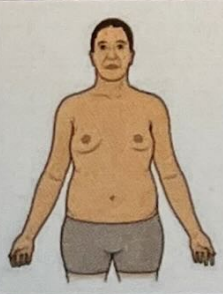
E.g. Turner's syndrome: One X chromosome is missing in females (XO);

Klinefelter's syndrome: One extra X chromosome is present in males (XXY).

Haemophilia affects the recessive gene located on X chromosome. It is a rare disorder in which the blood does not clot.



Turner's Syndrome



The signs:
- A taller less muscular body than males there age.
- Broader hips and longer legs.
- Larger breast.
- Weaker bones.
- A lower energy level.
- Smaller penis and testicles
- Delay in puberty or go a parcel amount.
- Less facial and body hair following puberty.

Klinefelter's Syndrome

2. ***Mendelian Disorders:*** Disorders that may occur mainly by the alteration or mutation in a single gene. E.g. Sickle cell anaemia, Thalassemia, Colour blindness, Haemophilia, etc.
3. ***Polygenic Disorders:*** Hypertension, Coronary heart disease, Diabetes, etc.

Glaucoma

• It is a disease that damages the *eye's optic nerve* leading to vision loss or blindness (usually a genetic disorder).

• Glaucoma is caused when there is an increase in *eye fluid pressure* (*Trachoma* is another disease in which fluid pressure of eye increases but due to a bacteria called *Chlamydia trachomatis*).

Pandemic, Epidemic and Endemic

Pandemic	*Epidemic*	*Endemic*
Sudden increase in cases across several countries, continents, or the world.	Sudden increase in cases spreading through a large population	The diseases that are constantly present in a population or region with relatively low spread.

Some Other Diseases

• ***Wilson Disease:*** Wilson disease is a rare, autosomal recessive disorder caused by abnormal *copper* accumulation in the body particularly involving the brain, liver, and cornea.

• ***Mad Hatter Disease:*** Mad hatter's disease refers to neurological symptoms of *mercury* poisoning (also responsible for *Minamata Disease*) over a long period of exposure.

• ***Siderosis Disease:*** It is caused due to excessive deposition of *iron* in body tissue.

• ***Itai Itai:*** It is caused due to *cadmium* deposition.

• ***Blue Baby Syndrome:*** It is caused due to *nitrate* deposition.

• Patau syndrome, also known as trisomy 13, is a genetic disorder caused by having an extra copy of chromosome 13.
• Charcot-Marie-Tooth disease is caused by duplication of the peripheral myelin protein-22 (PMP22) gene on chromosome 17.

DISEASES IN PLANTS

Disease	*Causal Organism*	*Affects*
Citrus canker	Bacteria	Affects citrus fruits
Rust of wheat	Fungus	
Yellow vein mosaic	Virus	Affects okara plants
Aster Yellow	Bacteria	
Crown Gall	Bacteria	
Ergot	Fungus	Affect bajra plants
Snow mold	Fungus	
Black knot	Fungus	
Blight	Fungus / Bacteria	
Tobacco mosaic virus	Virus	Tobacco plant

Some important points to remember:

• **Red Biotechnology** is applied to manufacture pharmaceutical products such as insulin, antibiotics and vaccines.

• Tooth decay by ***bacterium Streptococcus mutans.***

• ***Mesothelioma*** disease is characteristically and specifically linked to asbestosis.

• The natural host of Nipah virus is Fruit Bats.

• Red Sindhi breeds of cows are resistant to diseases.

• **Diseases caused by prions:**

- Scrapple in sheep.

- Bovine spongiform encephalopathy (BSE).

- Creutzfeldt-Jakob disease (CJD) in humans.

• Japanese encephalitis virus is spread by mosquitoes that causes inflammation in the brain.

• **About vaccination**

- In vaccination, a preparation of antigenic proteins of pathogens or inactivated/weakened pathogens (vaccine) are introduced into the body.

- The vaccines generate memory-B and T-cells that recognize the pathogens quickly.

• **Eating disorders:**

- ***Anorexia Nervosa***: a distorted perception of weight, trying to lose weight by exercising excessively.

- ***Bulimia Nervosa:*** eating too much.

• ***Emphysema:*** Chronic disease in which the inner walls of the lungs' alveoli become damaged, causing them to eventually burst.

• Jaundice is also called icterus.

• ***Epilepsy*** is a disorder resulting in abnormal electrical discharge from the brain cells causing seizures.

• **Forms of cancer:**

- **Carcinoma:** forms in epithelial cells.

- **Sarcoma:** develops in connective tissues.

- **Leukemia:** cancer of the blood forming tissue, particularly bone marrow.

- **Lymphoma:** begins in lymphocytes (T cells or B cells).

- **Melanoma:** originates in melanocytes.

- **Multiple Myeloma:** begins in plasma cells.

• Alexander Fleming, discovered the first true antibiotic, ***penicillin,*** in 1928.

• ***Insulin*** was discovered in 1921–1922 by a team led by Canadian physician Frederick Banting and student Charles Best.

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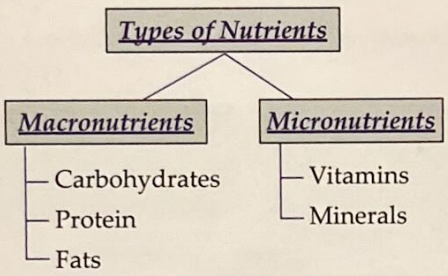
NUTRITION IN ANIMALS

Nutrients divided into two categories:

1. ***Macronutrients:*** Macronutrients are nutrients that the ***body needs in large amounts*** to function, including carbohydrates, fats, and proteins.
2. ***Micronutrients:*** Micronutrients are vitamins and minerals that the ***body needs in small amounts*** for growth, development, and health.

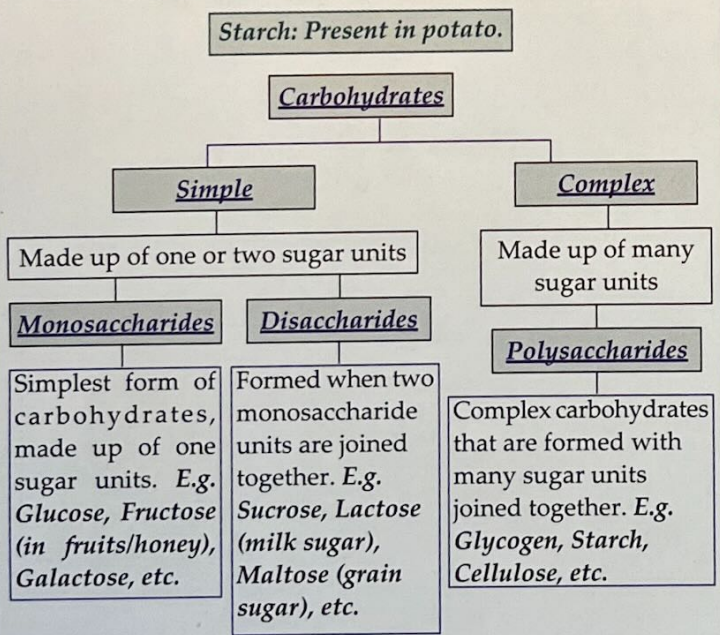


MACRONUTRIENTS

Carbohydrates

- Carbohydrates are biomolecules composed of carbon, hydrogen, and oxygen, primarily used as a source of energy in living organisms.
- These are quick form of energy.
- ***4 calories are released from 1 gm of carbohydrates.***

→ ***Carbohydrates Classification:***



- ***Oligosaccharides***: Carbohydrates that yield two to ten monosaccharides units on hydrolysis.
- **Glycemic Index (GI)**: Measures how quickly carbohydrate-containing food raise blood sugar levels on scale 0-100.

- **Low GI (0-55)**: best for blood sugar management e.g. oats, lentils, non-starchy vegetables, most fruits.
- **Medium GI (56-69)**: moderate impact e.g. sweet potato, basmati rice, muesli, pita bread.
- **High GI (70-100)**: Rapidly increases blood sugar e.g. white bread, white rice, sugary drinks, potatoes.

- **Amylopectin** is a branched-chain polysaccharide composed of glucose units linked primarily by α-1,4-glycosidic bonds.

**9 calories are released from 1 gm of fat.*

Fats

- Fats are a crucial type of nutrient, vital for energy, building cell structures, and supporting various bodily functions.
- ***Adipose tissues*** in our body store fats in the form of ***triglycerides.***

Types:

1. ***Saturated Fats:*** They are ***not easily digested*** as the molecules are tightly packed together. They have higher melting point and are found in red meat, pork, etc.
2. ***Unsaturated Fats:*** They are ***easily digested*** in our body and healthier in comparison to saturated fats. They are found in vegetable oil, nuts, and seeds.

Nuts, vegetable oil, fish are rich source of Omega-3.

Proteins

- Proteins are built from smaller units called ***amino acids.***
- ***Requirement: 0.8 gm/kg*** of body weight per day.
- ***Present in:*** Egg, yolk, soybeans, pulses, chicken, fish, etc.

Proteins in:

- ***Milk: Casein***
- ***Hair/Nail: Keratin***
- ***Rice: Glutelin, Albumin***
- ***Grains: Gluten***
- ***Egg white: Albumin***

The white part of an egg solidifies when cooked due to the process of protein denaturation.

Amino Acids

- Amino acids are the fundamental building blocks of proteins.
- There are total ***20*** amino acids, out of which ***9*** are essential amino acids.

Amino Acids	Functions
Histidine	Important for growth, tissue repair, and production of histamine (immune response)
Isoleucine	Helps in muscle metabolism and energy regulation; found in muscle tissue
Leucine	Stimulates protein synthesis, muscle repair, and regulates blood sugar levels
Lysine	Aids calcium absorption, collagen formation, and immune system function

Methionine	Involved in metabolism and detoxification; precursor of other amino acids
Phenylalanine	Precursor to neurotransmitters (dopamine, epinephrine)
Threonine	Helps with protein balance, tooth enamel, and fat metabolism
Tryptophan	Precursor of serotonin and melatonin (affects mood and sleep)
Valine	Promotes muscle growth and tissue repair; provides energy

Types:

1. ***Essential Amino Acids:*** Essential amino acids, which the ***body cannot synthesize,*** must be obtained through the diet.
2. ***Non-Essential Amino Acids:*** Non-essential amino acids can be ***produced by the body,*** but certain circumstances can make them temporarily essential.

→ ***Types:*** Glycine, Serine, Proline, Glutamic acid, Alanine, Aspartic acid, Cystine, Tyrosine, Asparagine, and Glutamine.

Diseases Caused by Deficiency of Proteins

Kwashiorkor

Kwashiorkor

• Kwashiorkor is a type of malnutrition characterized by severe ***protein deficiency.*** It causes ***fluid retention*** and a ***swollen, distended abdomen.***

• Kwashiorkor most commonly affects children, particularly in developing countries with high levels of poverty and food insecurity.

Marasmus

Marasmus

• Marasmus is a severe form of malnutrition caused by a ***lack of calories*** and ***protein,*** resulting in significant loss of ***muscle mass*** and ***subcutaneous fat.*** It's characterised by emaciation and wasting of the body, often affecting children in developing countries due to factors like poverty and food scarcity.

Vitamins

• Vitamins are essential, organic substances found in foods that are needed in small amounts for various bodily functions, including growth, metabolism, and nervous system activity.

Types of Vitamins

1. ***Water Soluble Vitamins:*** These vitamins ***dissolve in water*** and are not stored in the body → ***Vitamin B*** and ***Vitamin C.***
2. ***Fat Soluble Vitamins:*** These vitamins ***dissolve in fat*** and are stored in the body's fatty tissues and liver → ***Vitamin A, Vitamin D, Vitamin E, Vitamin K.***

1912: Casimir Funk, coined the term "Vitamin".

Vitamin	*Name*	*Deficiency/Symptoms*
Vitamin A	Retinol	Night blindness
Vitamin B1	Thiamine	Beriberi disease
Vitamin B2	Riboflavin	Decrease in RBC
Vitamin B3	Niacin	Pellagra
Vitamin B5	Pantothenoic Acid	Fatigue, numbness, muscle cramps
Vitamin B6	Pyridoxine	Anaemia
Vitamin B7	Biotin	Hair loss, brittle nails, skin rashes
Vitamin B9	Folic acid	Fatigue, neural tube defects in babies
Vitamin B12	Cyanocobalamin	Pernicious anemia, memory loss, fatigue
Vitamin C	Ascorbic Acid	Scurvy (bleeding gums)
Vitamin D	Calciferol	Osteomalacia, muscle pain, rickets
Vitamin E	Tocopherol	Anti-sterility, vision problems
Vitamin K	Phylloquinone	Excessive bleeding, poor blood clotting, hemorrhagic disease in newborns

• Vitamin K and C are maintained at high levels in poultry feed to support optimal growth and health.

• Intestinal Bacteria, primarily involved in synthesizing essential vitamins, including vitamin K (crucial for blood clotting) and several B- complex vitamins (B1, B2, B5, B7, B12).

Vitamin D

• It is also known as "Sunshine Vitamin". It is also considered as a hormone.

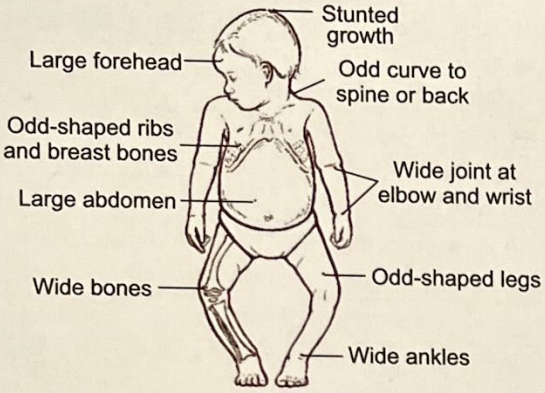
Types:

• Vitamin D2 (Ergocalciferol): Helps in calcium absorption.

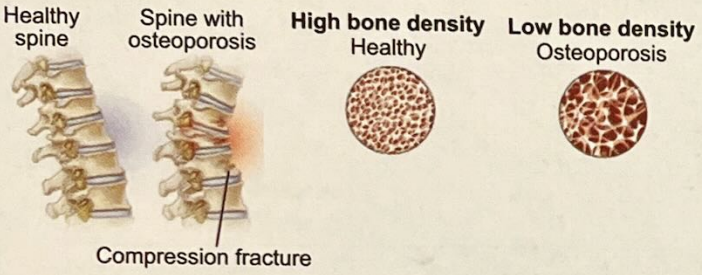
• Vitamin D3 (Cholecalciferol): More effective at raising vitamin D levels in the blood.

• Pellagra is also known as 3D Disease.

Vitamin	*Sources*
Vitamin A	Spinach, carrots, yellow fruits, sweet potatoes
Vitamin B	Meat (especially liver), seafood, poultry, eggs, dairy products, legunes, green leafy vegetables,
Vitamin C	Spinach, lemon, oranges, amla, strawberries
Vitamin D	Cod liver oil, salmon, swordfish, tuna, egg yolk
Vitamin E	Kale, spinach, lettuce, parsley
Vitamin K	Soya bean, coriander, green leafy vegetables, peas



Child Suffering from Rickets



Osteoporosis

Osteoporosis: *Osteoporosis is a bone disease that develops when bone mineral density and bone mass decreases.*

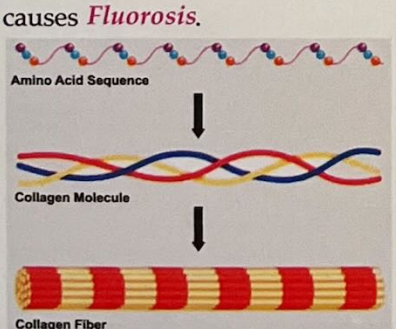
Osteomalacia: *Osteomalacia, also known as "soft bones", is a metabolic bone disease that weakens bones and makes, them more likely to break.*

Minerals

- Minerals are naturally occurring, inorganic chemical elements that the body needs in small amounts for proper development and functioning.
- Millets like *Jowar, Bajra, Ragi* have abundant minerals in them.
- ***Magnesium:*** Involved in metabolism, supports *bone health*. A typical adult human body contains about *25 g* of magnesium.
- ***Zinc:*** Important for wound healing, involved in *protein synthesis* and *cell growth*. It helps in the formation of insulin granules, digestion, metabolism and functioning of the male prostate.
- ***Iodine:*** Essential component of *thyroid hormone* which their regulates metabolism, growth, and development, iodine also impacts *brain function* and *cognitive development*.
- Excess fluoride in water causes *Fluorosis*.

Collagen

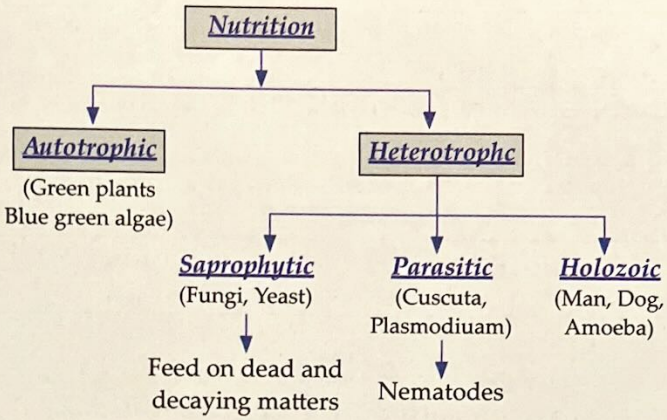
- Collagen is the most abundant protein of our body that is found in *extracellular spaces* (skin, bone joints).
- Triple helical structure of collagen was discovered by: *G. N. Ramachandran*.



Structure of Collagen

- *Vitamin C* is important for synthesis of collagen.

NUTRIENT IN PLANTS



1. ***Autotrophic:*** In this mode of nutrition an organism can *produce its own* food, using light, water, carbon dioxide, and other chemicals.
2. ***Heterotrophic:*** In this mode of nutrition an organism *cannot produce its own food*, however, takes nutrition from other organisms, primarily plant or animal matter.

Types:

(a) ***Saprophytic:*** In this type of nutrition, the organism, particularly fungi, obtain *nutrients directly from dead organic matter or wastes*.

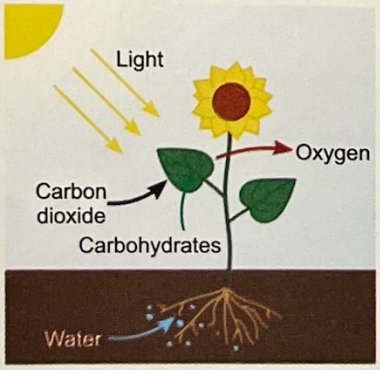
(b) ***Parasitic:*** In this type of nutrition, plants derive some or all of its nutrition requirements from *another living plant (host)*.

(c) ***Holozoic:*** In this type of nutrition, the organism consume *solid or liquid food* and break it down internally.

- *Detritivores: Organisms that ingest dead matter and then digest internally and absorb the nutrients.*
- *Euglena exhibits both autotrophic and heterotrophic modes of nutrition.*

Photosynthesis

- Photosynthesis is the process by which green plants make their own food using sunlight, carbon dioxide, and water.



$$\text{Carbon dioxide} + \text{Water} \xrightarrow{\text{Sunlight}} \text{Glucose} + \text{Oxygen}$$

$$6CO_2 + 6H_2O \xrightarrow{\text{Sunlight}} C_6H_{12}O_6$$

• It takes place in the leaves, in cells containing chlorophyll. Sunlight provides energy to split water into hydrogen and oxygen. Carbon dioxide from the air combines with hydrogen to form glucose (sugar). Oxygen is released as a byproduct.

• Chlorophyll makes plant appear green because it absorbs *red* and *blue light* from sunlight while *reflecting green light*.

• RuBisCO (Ribulose-1,5-bisphosphate carboxylase oxygenase) is the most abundant enzyme on Earth, essential for photosynthesis in plants, algae, and cyanobacteria.
• It captures CO2 from the atmosphere and attaches it to RuBP (Ribulose-1,5-bisphosphate), producing 3-PGA, which is used to make sugars.

Light and Dark Reaction in Chloroplast

Chloroplast

• A chloroplast is an organelle in plant cells and algae that converts *sunlight into chemical energy* through photosynthesis.

Two types of reactions takes place in Chloroplast:

Light Dependent Reaction

• The light-dependent reactions occur in the *thylakoid membranes* where light splits water into *Hydrogen* and *Oxygen* in the form of *ATP* and *NADPH*.

Light Independent Reaction *(Calvin Cycle)*

• The light-independent reactions occur in the *stroma* where there is a use of *ATP* and *NADPH* to convert *Carbon Dioxide* into *Glucose*.

Structure of Chloroplast

• ***Inner membrane:*** Controls the movement of materials in and out.

• ***Outer membrane:*** Protective layer; allows small molecules to pass.

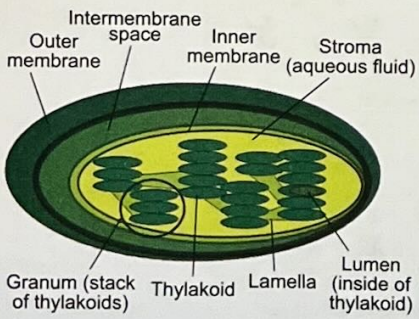
• ***Stroma:*** Fluid-filled space where the Calvin cycle occurs.

• ***Thylakoids:*** Disc-shaped sacs that contain chlorophyll.

• ***Grana (Granum):*** Stacks of thylakoids where light reactions take place.

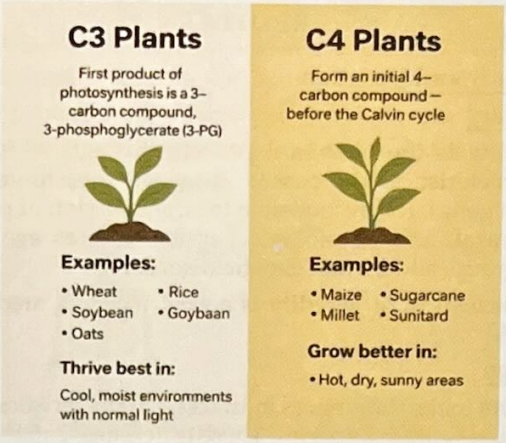
• ***Lamella:*** Membranous bridges connecting grana.

Mesophyll cells are primary site for photosynthesis.



Structure of Chloroplast

Guard cells regulate the opening and closing of stomata pores, and they respond to changes in carbon dioxide concentration in leaves.



Micronutrients and Macronutrients in Plants

Macronutrients	*Micronutrients*
N: Nitrogen	Fe: Iron
P: Phosphorus	Mn: Manganese
K: Potassium	Cu: Copper
S: Sulphur	Zn: Zinc
Ca: Calcium	B: Boron
Mg: Magnesium	Cl: Chlorine
C: Carbon	Mo: Molybdenum
H: Hydrogen	
O: Oxygen	

• *1828: Friedrich Wohler* synthesised *Urea*.

• Urea (CH_4N_2O or NH_2CONH_2) is a *Nitrogen* containing fertilizer.

• Legumes such as lentils do not require fertilisers as their roots have *Nitrogen Fixing Bacteria* such as *Rhizobium, Azotobacter*. They convert atmospheric Nitrogen into fixed Nitrogen that is usable by plants.

• Zinc plays a crucial role in the synthesis, storage and secretion of Insulin in the hexametric form as well as in the conformational integrity of Insulin.

Few Important Terms

• ***Xerophytes:*** Xerophytes are plants adapted to survive in *dry or arid environments*, characterized by limited water availability.

• ***Heliophytes:*** Heliophytes, also called sun-loving plants, are those that require full exposure to the sun for their optimum growth.

• ***Neophytes:*** A neophyte is a plant species which is *not native to a geographical region* and was introduced in recent history.

• ***Protophytes:*** Protophyte plants are *primitive, simple, and often microscopic plants* that represent the earliest forms of plant life.

• Pneumatophores are specialized roots in hydrophytes.

• Carnivores Plants- Venus, Pitcher plant, Sundew, Bladderwort. They do not need urea to grow because they digest insects and take nitrogen.

HEREDITARY

Hereditary and Variation

Hereditary

• Heredity is the biological process through which traits or characteristics are passed from parents to offspring through genes. It is responsible for transmission of physical, behavioural, and physiological traits, such as eye colour, blood group, and certain genetic disorders.

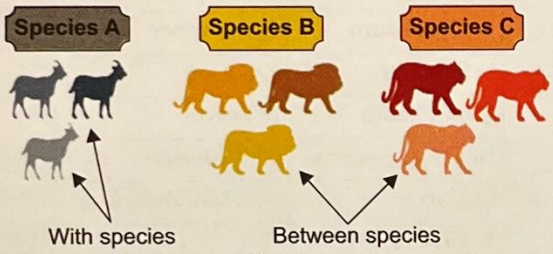
• The basic unit of heredity is a *gene* which is made up of *DNA*.

Variation

• It refers to the differences in traits or characteristics among individuals within a species. These differences can be caused by *genetic variations* or environmental factors that influence how genes are expressed.

• Variation is necessary for *survivability*.

• It is seen more in sexual organisms than asexual organisms (as only a single parent involved in asexual reproduction).



Types of Variation Within and Between Species

Genetic Traits

• A genetic trait is a characteristic or feature of an organism that is determined by genes and can be passed down from one generation to the next.

• Traits can be determined by genes, environmental factors or by a combination of both.

• Traits can be *qualitative* (such as eye color) or *quantitative* (such as height or blood pressure).

> ***Pleiotropy:*** *Pleiotropy is a genetic phenomenon where a single gene influences multiple, seemingly unrelated phenotypic traits.*

Types of Traits:

1. ***Acquired Traits:*** Characteristics that develop in an organism during its *lifetime* as a result of *environmental influences* rather than genetics. ***E.g. Teaching, riding bike, etc.***
2. ***Inherited Traits:*** Characteristics or quality that is passed down from *parents to their offsprings through DNA*. ***E.g. Eye colour, blood group, etc.***

Alleles

• Alleles are *alternate forms of genes, or DNA sequence*, that occur at the same location on a chromosome. Alleles control the same trait, but they can produce different effects.

Types of Alleles:

1. ***Dominant Traits:*** Trait that is expressed out when *one or both alleles are dominant*.
2. ***Recessive Traits:*** Trait that is expressed out when *both the alleles are recessive*.

GREGOR MENDEL'S EXPERIMENT

• Gregor Johan Mendel is known as *"Father of Genetics"*. He conducted experiments of Inheritance traits in *Pea Plant* (Pisum sativum).

Reasons for Choosing a Pea Plant

• It is easier to grow.

• It has short life cycle.

• It can be self-pollinated or cross-pollinated by hand.

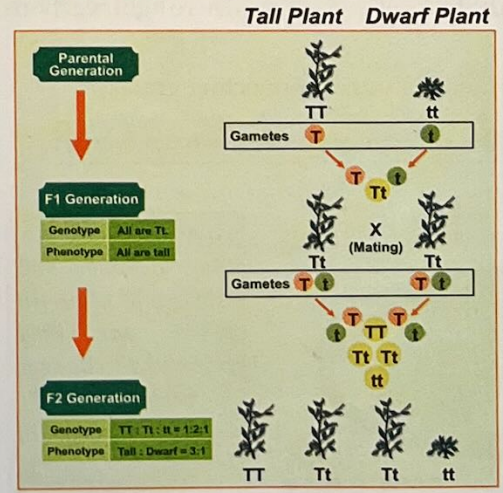
• Different traits were easily observable.

• Many offsprings of pure pea plant can be easily obtained through self-pollination.

Pea trait	Dominant Trait	Recessive Trait
Seed shape	Round	Wrinkled
Seed colour	Yellow	Green
Flower colour	Purple	White
Flower position	Axial	Terminal
Plant height	Tall	Short
Pod shape	Inflated	Constricted
Pod colour	Green	Yellow

Three Laws of Inheritance (proposed by Gregor Mendel)

1. ***1st Law (Law of Dominance):*** It stated that when parents with contrasting traits are crossed, only the *dominant trait will appear* in the offsprings.
2. ***2nd Law (Law of Segregation):*** It stated that during the formation of gametes, the pairs of gene variants, or alleles are separated from each other. Each gamete receives one allele.
3. ***3rd Law (Law of Independent Assortment):*** It stated that during gamete formation, alleles of two (or more) different genes get sorted into *gametes independently of one another*.



	T	t
T	TT	Tt
t	Tt	tt

TT: Dominant trait
tt: Recessive trait

• A monohybrid cross is a genetic experiment that studies how a ***single trait*** is passed from parents to their offspring. It involves crossing ***two organisms that differ in one trait.*** ***E.g. A cross between a tall pea plant and a short (dwarf) pea plant.***

Observation

• In the first generation Mendel found that all the offspring shared one feature, which he called dominant trait (they were all tall), and did not display any recessive trait.

• When the first-generation plants were self-fertilized, the second generation showed the reappearance of the recessive trait in about 1 out of every 4 plants. This resulted in a 3:1 ratio, with three plants showing the dominant trait for every one showing the recessive trait.

Dihybrid Cross

• A dihybrid cross is a genetic cross involving ***two different traits***, each with ***two contrasting alleles***, where both parents are ***heterozygous*** for both traits. ***E.g. A cross between a seed shape (round vs. wrinkled) and seed color (yellow vs. green).***

Observation

• In the first generation of the dihybrid cross, Mendel found that all the offspring showed both ***dominant traits*** (round and yellow seeds), with ***no sign of the recessive traits*** (wrinkled and green).

• When these first-generation plants were self-fertilized, the second generation showed new combinations of traits. Mendel observed four types of offspring → some showed ***one dominant*** and ***one recessive trait***.

• This resulted in a ***9 : 3 : 3 : 1*** ratio, with ***nine*** showing ***both dominant traits***, ***three*** showing ***one dominant (YR)*** and ***three recessive trait (yR)***, another ***three*** showing the other combination ***(Yr)***, and ***one showing both recessive traits (yr)***.

• Recessive alleles are hidden in F1 but reappear in F2 due to segregation.

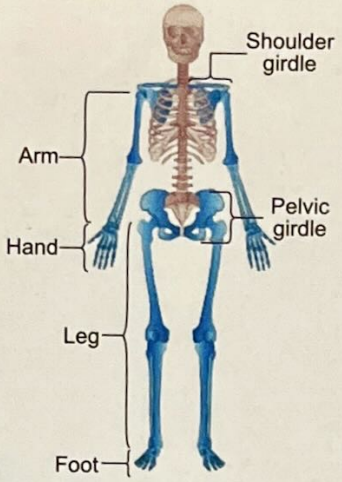
Homologous Organ and Analogous Organ

Homologous Organ	***Analogous Organ***
They are organs that have the same structure but different function and are inherited from an common ancestor	They are organs of different species that have different anatomical structure but perform similar functions

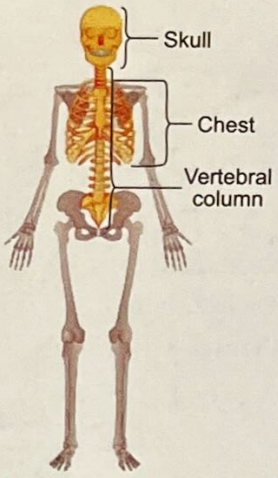
(a) Homologous structures *(b) Analogous structures*

SKELETAL SYSTEM

• The skeletal system is the body's framework, providing support, protection, and allowing for movement. It comprises bones, cartilage, and ligaments, and is divided into the axial and appendicular skeletons.



Appendicular skeleton



Axial skeleton

Appendicular Skeleton

• It provides support and leverage for limb movement; facilitates locomotion; and includes bones that are primarily involved in movement. ***E.g. bones in shoulder, pelvis, limbs, etc.***

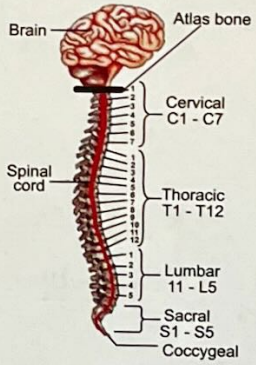
Bones in adult human beings: 206
Bones in children: 300
Total Axial bones: 80
Total Appendicular bones: 126

Axial Skeleton

• It protects the brain, spinal cord, heart, and lungs; supports the head, neck, and body; and provides a rigid framework for muscle attachment. ***E.g. Bones in head, neck, back including skeleton etc.***

Atlas bone

• The bone that connects the skull to the spine and supports the head.



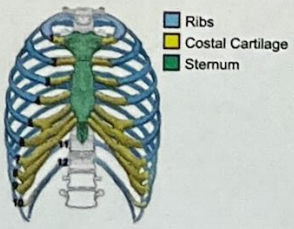
Bones in Spinal Cord

• ***Adults only have 26 bones.***
• ***Cervical:*** 7 vertebrae
• ***Thoracic:*** 12 vertebrae
• ***Lumbar:*** 5 vertebrae
• ***Sacral:*** 5 vertebrae (fuse to form 1 sacrum)
• ***Coccygeal:*** 4 vertebrae (fuse to form 1 coccyx (tailbone)

Sternum

Central part of the chest.

• It is connected to ribs via cartilage.

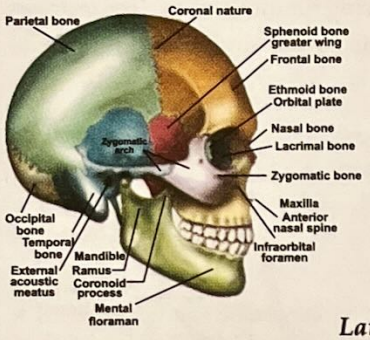


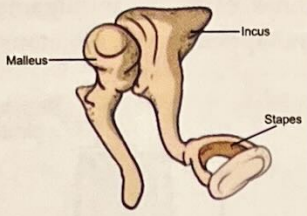
Bones in Rib Cage

• ***Total:*** 24 + 1 (sternum) = 25

Bones in Ear

- **Total:** 3 × 2 = 6
- **Incus, Malleus, Stapes**

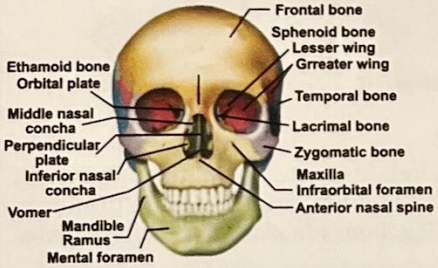




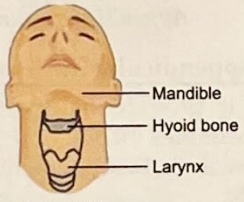
Lateral view

Bones in skull

- **Total:** 22 bones
- **Cranial:** 8
- **Facial:** 14

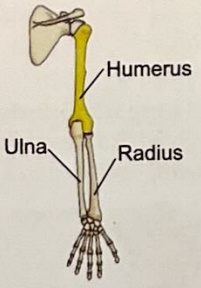


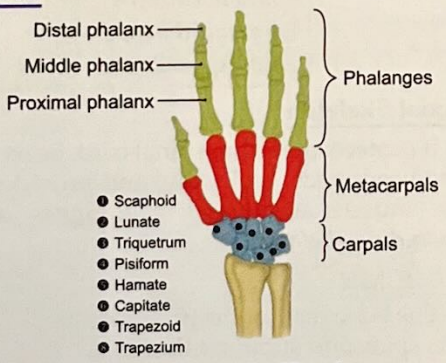
Frontal view



Hyoid bone

Appendicular Skeleton





Bones in Arm

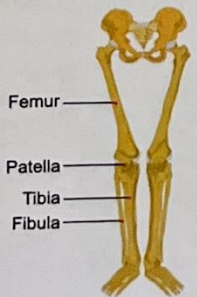
- **Total:** 3
- **Radius, Ulna, Humerus**

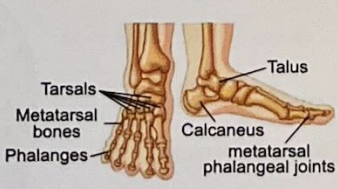
Bones in Hand

- **Total:** 27
- **Phalanges:** 14
- **Metacarpals:** 5
- **Carpals:** 8

27 + 3 = 30

30 × 2 (arm) = 60





Bones in Legs

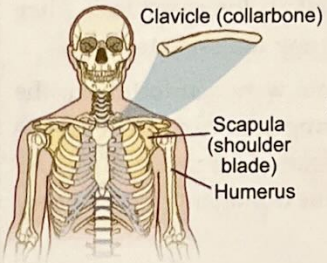
- **Total:** 4
- **Femur** (thigh bone): 1
- **Patella:** 1
- **Tibia:** 1
- **Fibula:** 1

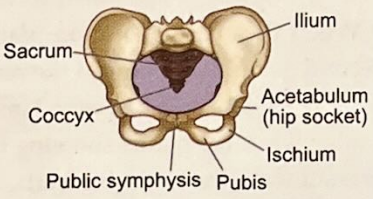
} 4 × 2 = 8

Bones in Foot

- **Total:** 26
- **Tarsals:** 7
- **Metalarsal:** 5
- **Phalanges:** 14

} 26 × 2 = 52





- ***Clavicle:*** 2
- ***Scapula:*** 2

Bones in Pelvis

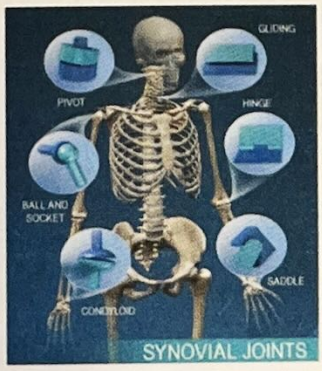
- ***Total:*** 2

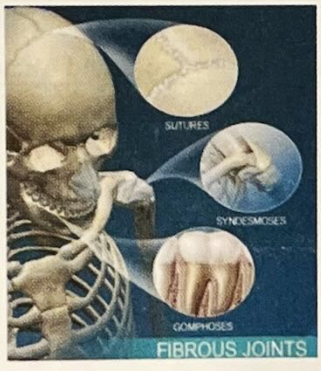
Joint

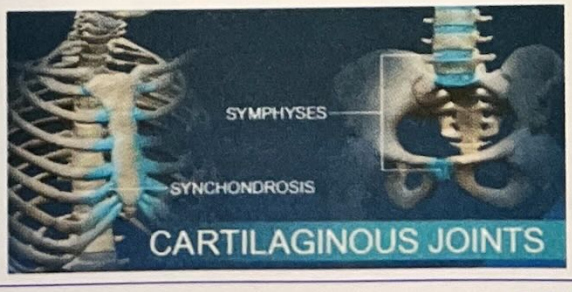
- A joint is a point or location where *two or more bones meet*, allowing for movement. Joints are also called *articulations*, and they are essential for flexibility and mobility in the skeletal system.

Joints and its Types

1. ***Synovial Joint:*** These joints have a *fluid-filled cavity* between the bones, allowing for a *wide range of motion*. ***E.g. knee, elbow, and shoulder.***
2. ***Fibrous Joint:*** These joints connect bones with dense connective tissue, allowing for *little to no movement*. ***E.g. Sutures in the skull and the connection between teeth and the jawbone.***
3. ***Cartilaginous Joint:*** In these joints, bones are connected by cartilage, allowing for *slight movement*. ***E.g. Joints between vertebrae and the connection between ribs and the sternum.***







Teeth and its Structure

Tooth anatomy

→ ***Total adult teeth:*** 32 permanent teeth (16 in upper jaw + 16 in lower jaw including wisdom teeth)

- *Incisors: 4* → They are used for bitting and cutting of food.
- *Canine: 2* → They are used for tearing of food.
- *Premolars: 4* → They are used in grinding of food.
- *Molars: 6* → They are used for chewing and crushing of food.

Enamel

- Hardest part of the body (made of Calcium phosphate).

Dental Formula

$$\frac{2,1,2,3}{2,1,2,3} = \frac{I,C,P,M}{I,C,P,M} \rightarrow Adults$$

$$\frac{2,1,0,2}{2,1,0,2} = \frac{I,C,P,M}{I,C,P,M} \rightarrow Children$$

- Total: 20 (milk teeth)

**In children there are no premolars.*

Sex Determination

- Sex determination is the biological system that decides whether an individual organism will develop as male or female. It is based on genetic, chromosomal, environmental, or a combination of factors.

In humans, there are 23 pairs of chromosomes:

→ 22 pairs are autosomes

→ 1 pair is the sex chromosomes

Sex Chromosomes in Humans

- ***Females:*** Have XX chromosomes.
- ***Males:*** Have XY chromosomes.

Who Determines the Sex of the Baby?

- The father's sperm determines the child's sex.
- The mother's ovum always carries an *X chromosome*. The sperm may carry either:
- *X chromosome → XX = Female child*
- *Y chromosome → XY = Male child*

Some important points to know:

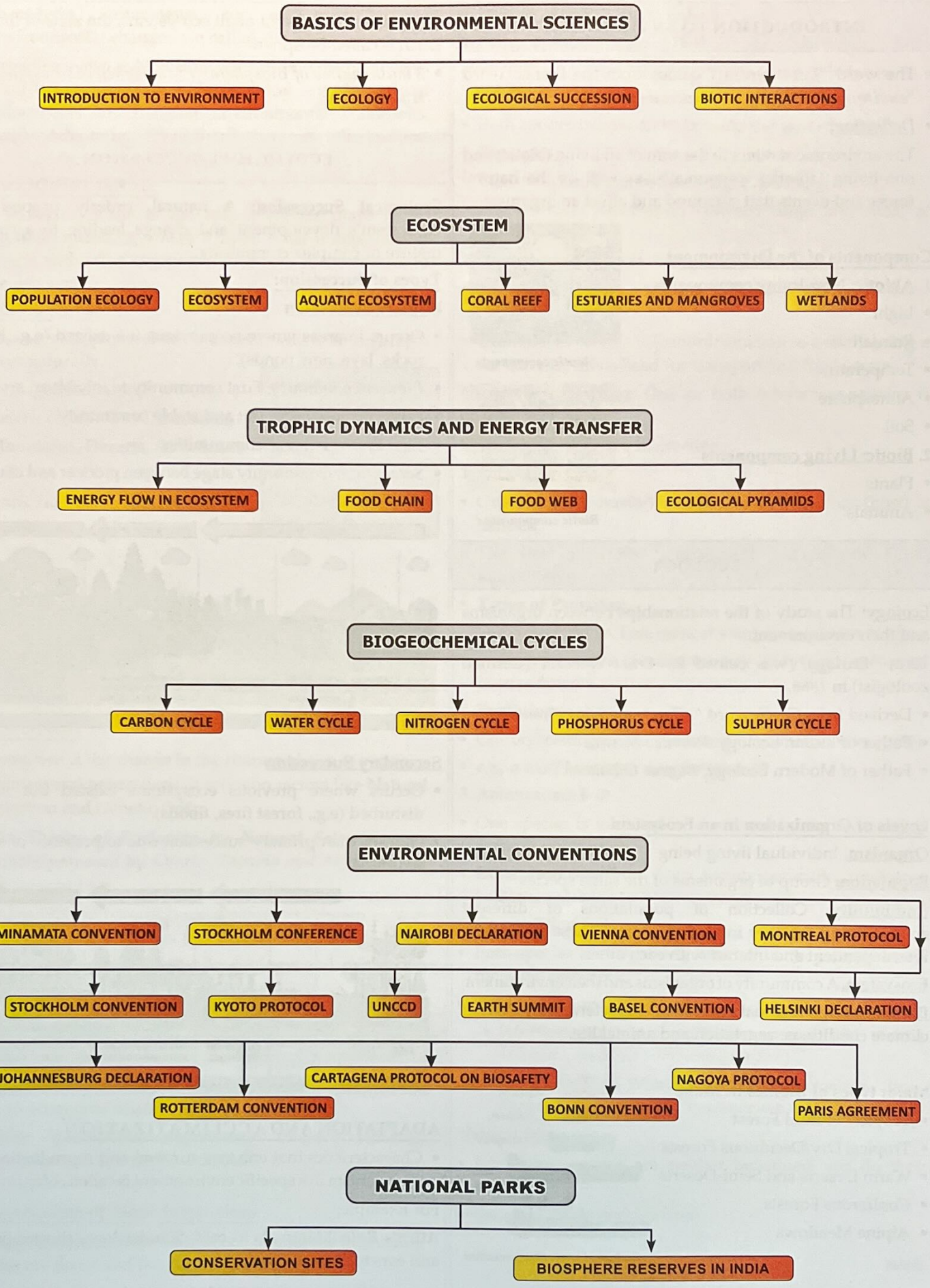
- Mammals in colder climates have shorter ears and limbs to minimize heat loss.
- Hybridization in plants includes:

- Intraparietal
- Interspecific
- Intergeneric.

Punnett square: A grid tool used in genetics to predict the potential offspring genotypes and phenotypic ratios from a cross between two parents.

- The phenomenon of the interaction between nonallelic genes at two or more loci resulting in one gene masking the phenotypic expression of another gene, is known as ***epistasis***.
- Acetocarmine can be applied to achieve staining of chromosomes.
- ***Masseter muscle*** is located in the jaw.

ENVIRONMENT


BASICS OF ENVIRONMENTAL SCIENCES
INTRODUCTION TO ENVIRONMENT
ECOLOGY
ECOLOGICAL SUCCESSION
BIOTIC INTERACTIONS
ECOSYSTEM
POPULATION ECOLOGY
ECOSYSTEM
AQUATIC ECOSYSTEM
CORAL REEF
ESTUARIES AND MANGROVES
WETLANDS
TROPHIC DYNAMICS AND ENERGY TRANSFER
ENERGY FLOW IN ECOSYSTEM
FOOD CHAIN
FOOD WEB
ECOLOGICAL PYRAMIDS
BIOGEOCHEMICAL CYCLES
CARBON CYCLE
WATER CYCLE
NITROGEN CYCLE
PHOSPHORUS CYCLE
SULPHUR CYCLE
ENVIRONMENTAL CONVENTIONS
MINAMATA CONVENTION
STOCKHOLM CONFERENCE
NAIROBI DECLARATION
VIENNA CONVENTION
MONTREAL PROTOCOL
STOCKHOLM CONVENTION
KYOTO PROTOCOL
UNCCD
EARTH SUMMIT
BASEL CONVENTION
HELSINKI DECLARATION
JOHANNESBURG DECLARATION
ROTTERDAM CONVENTION
CARTAGENA PROTOCOL ON BIOSAFETY
BONN CONVENTION
NAGOYA PROTOCOL
PARIS AGREEMENT
NATIONAL PARKS
CONSERVATION SITES
BIOSPHERE RESERVES IN INDIA

INTRODUCTION TO ENVIRONMENT

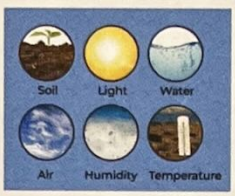
- The word *"Environment"* comes from the French word *"environner"*, meaning *"to surround"*.
- ***Definition:***

  The environment refers to the sum of all living (biotic) and non-living (abiotic) components, as well as the natural forces and events that surround and affect an organism.

Components of the Environment

1. Abiotic: Non-living components

- Light
- Rainfall
- Temperature
- Atmosphere
- Soil



Abiotic components

2. Biotic: Living components

- Plants
- Animals

Biotic components

ECOLOGY

Ecology: The study of the relationships between organisms and their environment.

Term *"Ecology"* was coined by *Ernst Haeckel* (German zoologist) in *1866*.

- Derived from Greek word *"oikos"*, meaning *"house"*.
- Father of Indian Ecology: *Ramdeo Mishra*
- Father of Modern Ecology: *Eugene Odum*

Levels of Organization in an Ecosystem

Organism: Individual living being

Population: Group of organisms of the same species

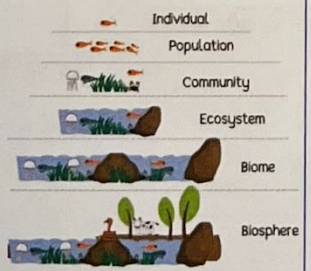
Community: Collection of populations of different species living together in a specific area. These species are interdependent and interact with each other.

Ecosystem: A community of organisms and their environment.

Biome: A large regional ecosystem characterised by distinct climate conditions, vegetation and animal life.

Major types of Biomes in India:

- Tropical Humid Forest
- Tropical Dry/Deciduous Forests
- Warm Deserts and Semi-Deserts
- Coniferous Forests
- Alpine Meadows



Ecological levels of organisation

Biosphere: Global sum of all ecosystems, the zone of life on Earth is called Biosphere.

- ***3 main realms of Biosphere*** → *Atmosphere, Lithosphere & Hydrosphere.*

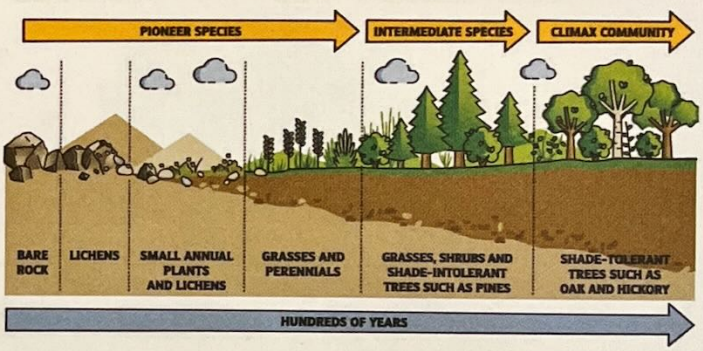
ECOLOGICAL SUCCESSION

Ecological Succession: A natural, orderly process of ecosystem's development and change leading to a stable mature or complex community.

Types of Succession:

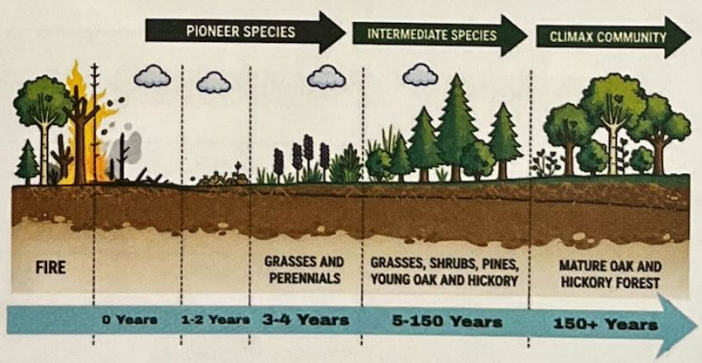
Primary Succession

- Occurs in areas where no previous life existed (**e.g.**, bare rocks, lava, new ponds).
- ***Pioneer community:*** First community to inhabit an area
- ***Climax community:*** last and stable community.
- ***Sere:*** Entire series of communities.
- ***Seral stage:*** Community stage between pioneer and climax community.



Secondary Succession

- Occurs where previous ecosystems existed but were disturbed (e.g., **forest fires, floods**).
- Quicker than primary succession due to presence of soil/ sediment.



ADAPTATION AND ACCLIMATIZATION

- Characteristics that enhance survival and reproduction of an organism in a specific environment is called *Adaptation*.

For Example:

Allen's Rule: Mammals in cold climates have shorter limbs and ears to minimise heat loss.

- **Short-term adjustments by an organism to environmental changes are called** *Acclimatization.*
- Organisms also exhibit acclimatization, which involves short-term, reversible physiological or behavioral adjustments to changing environmental conditions. Unlike Adaptation, these changes are not inherited but occur within an individual's lifetime.

ECOLOGICAL NICHE

An ecological niche is the role a species plays in its ecosystem, including where it lives, what it eats, how it interacts with other organisms, and how it contributes to the environment.

HABITAT

- The specific physical environment where an organism lives naturally.

It is categorised into:

Terrestrial Habitat → Land based

- **Mountains, Deserts, Grasslands**

Aquatic Habitat → Water based

- **Oceans, Rivers, Lakes**

An ecotone is a transitional area where two different ecosystems or biomes meet and interact.

Maximum biodiversity is seen in an ecotone.

SPECIES

- A species is a group of similar organisms capable of interbreeding and producing fertile offspring.
- It is the *basic unit of classification in taxonomy.*

EVOLUTION

- Evolution is the change in the characteristics of a species over several generations, it relies on factors like Natural Selection and Genetic Drift.
- ***The Theory of Evolution by Natural Selection was jointly proposed by Charles Darwin and Alfred Russel Wallace in 1859.***
- The modern version of Darwin's theory is known as *Neo-Darwinism.* It integrates Darwin's natural selection with Mendelian genetics, molecular biology, and population genetics.

BIOTIC INTERACTIONS

- Biotic interactions refer to the ways that living organisms in an ecosystem relate to each other.
- These interactions significantly impact survival, reproduction, and population size.

Categorisation of Biotic Interactions

Positive Interaction: Member of one or both the interacting species are benefitted but neither is harmed.

Examples of Positive Interaction-

1. Mutualism / Symbiosis (+ +)

- A close and often *obligatory relationship* between two species
- Both species benefit and often depend on each other.
- Examples:

  Lichens: Mutualism between algae and fungi.

  Mycorrhizae: Association between fungi and roots of higher plants.

2. Commensalism (+ 0)

- One species benefits, while the other is neither harmed nor benefited.
- Example: *Sucker fish (Remora)* attaches to a shark using a suction disc on its head for transport and food scraps.

Negative Interaction: One or both interacting species is harmed.

Examples of Negative Interaction -

1. Parasitism (+ -)

- One species (parasite) benefits, while the other (host) is harmed.
- The host provides nourishment but is not killed immediately.
- **Types of Parasites:**

  → *Ecto-parasites:* Live on host's surface (e.g., *lice, leeches*)

  → *Endo-parasites:* Live inside host's body (e.g., *tapeworm, plasmodium*)

2. Predation (+ -)

- One organism (predator) kills and consumes another (prey).
- *e.g., a wolf hunting a deer for food.*

3. Amensalism (- 0)

- One species is inhibited or destroyed by another, which remains unaffected.
- **Example:** *Penicillium fungi* secrete penicillin, inhibiting bacterial growth.

4. Competition (- -)

- Both species are negatively affected as they compete for the same resources.
- **Types of Competition:**

  → *Inter-specific:* Between different species (e.g., *sharks, dolphins, seabirds competing for fish*)

  → *Intra-specific:* Within the same species (e.g., *Paramecium aurelia vs. Paramecium caudatum*)

Neutral Interaction:

- Interacting species are neither benefitted nor do they suffer.
- Example: *Birds and Squirrels*

POPULATION ECOLOGY

Population Ecology is the study of populations in relation to environment.

- ***Population size:*** Number of individuals in a defined geographic area which is governed by:
- Natality (birth rate)
- Mortality (death rate)
- Immigration (entry into population)
- Emigration (exit from population)
- Dispersion is a pattern of spacing among individuals within the geographic boundaries. Three types of Dispersion are-

  Clumped, Uniform, Random
- ***Biotic Potential:*** Maximum reproductive capacity under optimal conditions.
- ***Carrying Capacity:*** Maximum sustainable population size in an environment.
- ***Limiting Factors:*** Environmental variables that restrict population growth.

Life history Strategies

- These strategies describe how organisms adapt their reproductive and developmental traits to different environmental conditions and resource availability.

Feature	*r-selected species*	*K-selected species*
Size	Small	Large
Reproduction	Many offsprings, short time	Few offsprings, long time
Life Expectancy	Short lifespan	Long lifespan
Example	Insects, frogs, weeds, bacterias, etc.	Humans, Elephants, whales, trees, etc.

ECOSYSTEM

- The term ***"Ecosystem"*** was coined by ***"Sir Arthur George Tansley"*** in ***1935***.
- An ecosystem is a functional unit where living organisms interact with each other and their physical environment.
- It was described as the ***basic unit of ecology by Francis Evans in 1956.***
- Ecosystems provide the following services:
  a) ***Provisioning Services:*** Direct material benefits like **food, water, wood, fuel**.
  b) ***Regulating Services:*** Help maintain ecological balance like **air/ water quality, flood control, pollination**.
  c) ***Supporting Services:*** Enable other services **(e.g., habitats, genetic diversity)**.
  d) ***Cultural Services:*** Non-material benefits **(e.g., recreation, spiritual value)**.

TERRESTRIAL ECOSYSTEM

- Land-based ecosystems involving interaction of biotic and abiotic components in a given area

  Subdivisions of Terrestrial Ecosystem are:

  a) Forest Ecosystem

  b) Grassland Ecosystem

  c) Desert Ecosystem

  d) Tundra Ecosystem

DEFORESTATION

Deliberate clearance of forests is known as Deforestation.

Causes for deforestation:

- Shifting cultivation
- Development projects
- Fuel needs
- Raw material demands

Effects of Deforestation on Ecosystem:

- Lower groundwater levels
- Reduced precipitation
- Soil erosion
- Landslides

DESERTIFICATION

- Continuous degradation of dry land ecosystems due to climate change and human activity is called Desertification.

ECOSYSTEM

Aquatic Organisms

- **Classification of Aquatic Organisms:**

Neuston: Float attached to the upper surface of water

Periphyton: Attached to submerged surfaces **(e.g., Algae, Cyanobacteria)**

Plankton: ***Phytoplankton*** → autotrophs ***(e.g., algae)***

Zooplankton → freely floating and bottom dwelling ***(e.g., crustacean, Protozoa)***

Nekton : Organisms capable of active locomotion **(e.g., fish, squid)**

Benthos: Bottom dwelling organisms. **(e.g. crabs, mollusks)**

Factors affecting Productivity in Aquatic Habitats

- **Sunlight:**

  Photic Zone: Upper layer where light enables photosynthesis

  Aphotic Zone: Deeper layer, where light penetration is restricted, hence, limited to respiration only.

- **Dissolved Oxygen(DO):**

  Cold water holds more oxygen than warm water.

  DO ***below 3-5 ppm*** can ***harm*** aquatic life

TYPES OF AQUATIC ECOSYSTEM:

Aquatic ecosystems are categorized based on the nature and movement of water.

1. Lentic Ecosystem:

- Still water bodies like lakes, ponds, and swamps.
- Also known as ***lacustrine ecosystems***.
- Productivity influenced by nutrient content, light penetration, and depth.

2. Lotic Ecosystem:

- Flowing water systems such as rivers and streams.
- Known as ***riverine ecosystems***.
- Well-oxygenated and nutrient-rich; organisms adapt to water currents.

3. Marine Ecosystem:

- Saltwater environments like oceans and seas with ***salinity ≥35 ppt.***
- Cover over ***70%*** of Earth's surface.
- Include diverse habitats like ***estuaries*** and ***coral reefs***.
- Dominated by producers such as phytoplankton and algae.

CORAL REEF

Coral reefs are complex underwater structures formed by colonies of tiny animals called ***coral polyps***, which are related to jellyfish and sea anemones.

- Each ***polyp*** secretes a ***calcareous exoskeleton***, which remains after it dies and serves as a base for new polyps.
- Over time, this leads to the formation of large reef structures.

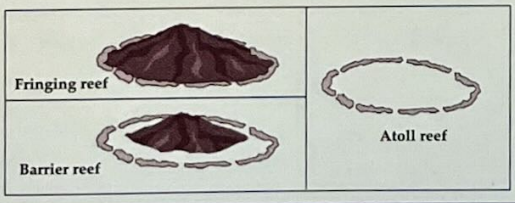
Ideal Conditions for Coral Growth:

- Shallow, sunlit waters (up to 30 meters deep)
- Warm temperatures (typically 25-30°C)
- Clean and clear saline water
- Low nutrient levels (corals thrive in oligotrophic conditions)

Can you recall the phylum of Corals?

TYPES OF CORAL REEFS

- ***Fringing Reefs:*** Closest to the shoreline, directly attached to land.
- ***Barrier Reefs:*** Separated from land by a lagoon; typically found further offshore.
- ***Atoll reefs:*** An atoll is a ring-shaped coral reef that encircles a central lagoon, but no central island is visible above sea level.



Threats to Coral Reefs:

- **Global Warming:** Leads to temperature rise and coral stress
- **Coral Bleaching:** Expulsion of symbiotic algae due to heat
- **Ocean Acidification:** Increased CO_2 makes seawater more acidic, weakening coral skeletons
- **Pollution and Sedimentation:** Reduce light penetration and smother coral
- **Natural Disasters:** Storms and tsunamis can break coral structures

Coral Reefs in India:

→***Gulf of Mannar***
→***Andaman & Nicobar Islands***
→***Lakshadweep Islands***
→***Gulf of Kutch***

Coral Reef

ESTUARIES AND MANGROVES

ESTUARIES

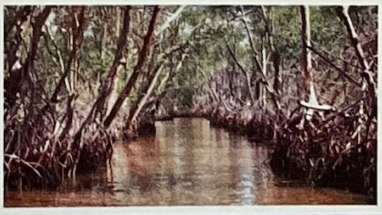
- The region where rivers meet the sea
- Form a ***transition zone i.e. ecotone*** between freshwater and marine ecosystems
- Mostly rich in diatoms, dinoflagellates, green & blue-green algae

MANGROVES

- Mangroves are ***salt-tolerant trees (halophytes)*** that grow in coastal intertidal zones, especially in tropical and subtropical regions.
- They act as a transitional zone (ecotone) between ***land and sea***.
- With their dense root systems, mangroves stabilize shorelines, reduce erosion, and serve as natural barriers against storm surges and tsunamis.
- They thrive in saline, waterlogged, and oxygen-poor soils.

Functions:

- **Produce Pneumatophores:** Aerial roots that facilitate breathing in anaerobic soil
- **Viviparous in nature:** Seeds germinate while still attached to the parent tree.
- ***Salt Excretion/Filtration:*** Roots filter salt or excrete it via leaves.
- Helps in carbon sequestration, storing more carbon per hectare than most other forests
- Support biodiversity and act as buffers against extreme weather events.



Mangroves

WETLANDS

- Wetlands are Transitional lands between aquatic and terrestrial ecosystems.
- They act as *ecotones and buffer zones*
- **Examples:** *Chilika Lake, Keoladeo Ghana*

  Chilika Lake (Odisha) and *Keoladeo National Park* (Bharatpur) are protected as *waterfowl habitats* under the convention of wetlands of international importance *(Ramsar convention)*.
- **Montreux Record:** A list of 48 endangered wetlands. *India's Keoladeo National Park of Rajasthan and Loktak Lake of Manipur* are on that list

Challenges in Aquatic Ecosystems:

Eutrophication: A process by which a water body becomes overly enriched with nutrients, resulting in oxygen depletion and excessive algae growth.

Types of Eutrophication

Natural Eutrophication: Gradual aging of lakes via nutrient accumulation.

Cultural Eutrophication: Accelerated by human activity (e.g., fertilisers, sewage discharge etc.)

Effects of Eutrophication

- Algal bloom
- Oxygen depletion - due to which the Biological Oxygen Demand increases.
- Decline in aquatic biodiversity

Algal Bloom

It refers to the rapid increase of algae population in a water body.

Effects of Algae bloom:

- Toxin production
- Creation of dead zones (Hypoxia)
- Harmful to humans and animals

Algae Bloom

Hypoxia: *Very less oxygen concentration in a water body for living organisms to survive.*

ENERGY FLOW IN ECOSYSTEM

Energy is the fundamental driving force behind all biological and metabolic processes. Energy flow in an ecosystem is *unidirectional* i.e. from producers to top consumers.

- **Trophic level interactions** help illustrate how organisms are interconnected via food and energy transfer.

TROPHIC LEVEL INTERACTION

- *Trophe* means *nourishment*
- A trophic level refers to an organism's position in the food chain.
- Energy flows only from *lower to higher trophic levels*.
- At each level, energy is lost as heat, reducing available energy at higher trophic levels.

Trophic Levels		
I	Autotrophs	Green plants (Producers)
II	Heterotrophs	Herbivore (Primary consumers)
III	Heterotrophs	Carnivores (Secondary Consumers)
IV	Heterotrophs	Carnivores (Tertiary Consumers)
V	Heterotrophs	Top carnivores (Quaternary consumers)

FOOD CHAIN

- A food chain is a linear sequence of organisms where each is eaten by the next member in the chain.
- Plants convert solar energy into chemical energy through *photosynthesis*.
- It demonstrates the flow of energy and nutrients.

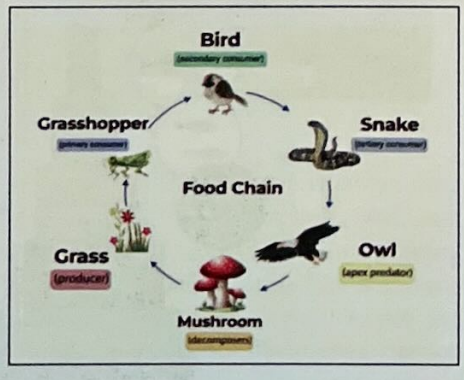
Food Chain:

Producers (plants)→ Primary Consumers (herbivores) → Secondary Consumers (carnivores)→ Tertiary Consumers

Types of Food Chains

1. Grazing Food Chain:

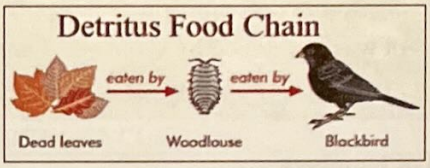
- Starts with green plants (producers) that are consumed by herbivores and subsequently by carnivores.
- Main source of energy- *Plant biomass*



- **Example: Grass → Grasshopper → Frog → Snake → Hawk**

2. Detritus Food Chain:

- Begins with *dead organic matter (detritus)* consumed by decomposers and detritivores (**e.g., beetles, worms**).
- Main source of energy: *dead organic matter*
- Microorganisms play a crucial role in breaking down complex organic materials.



STAGES OF DECOMPOSITION

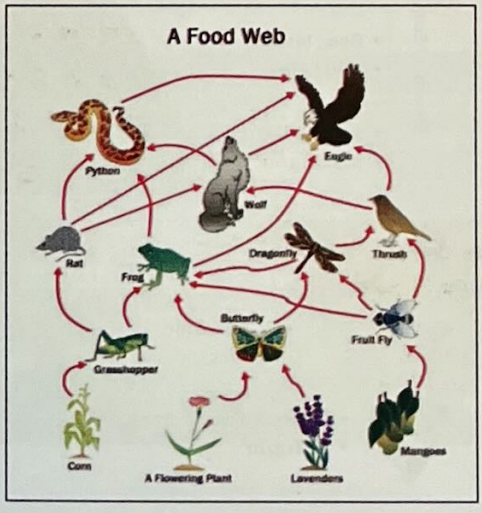
- *Fragmentation:* Breakdown of dead organic matter into smaller pieces (**e.g., by beetles, worms**).
- *Leaching:* Water-soluble nutrients are washed away.
- *Catabolism:* Microbial breakdown of organic compounds into simpler substances.
- *Humification:* Formation of humus (a dark-colored, amorphous, colloidal organic substance)
- *Mineralization:* Final step-conversion of organic matter into inorganic nutrients.

Favourable Conditions for Decomposition:

- *High temperature*
- *High nitrogen content*
- *Low lignin and chitin in detritus*

FOOD WEB

- A food web represents all possible feeding relationships among organisms in an ecosystem, an *accumulation of various food chains*.
- More realistic than a food chain, as it depicts the interconnectedness of food pathways.
- Reflects the complex and non-linear flow of energy and nutrients.



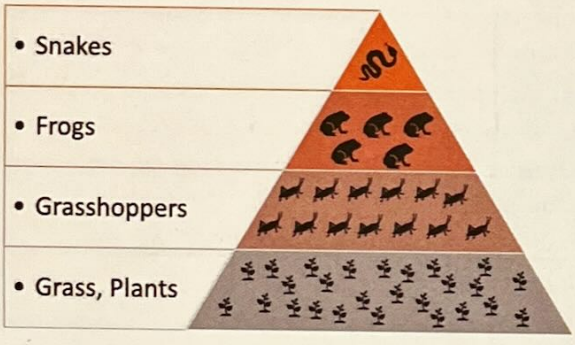
ECOLOGICAL PYRAMIDS

Ecological pyramids are graphical representations of trophic levels in an ecosystem.

- With each step from the producer to the consumer level, the number, biomass and energy of organisms decrease. Hence the diagrammatic depiction takes a pyramid form.
- This concept was developed by *Charles Elton in 1927*.
- Following are the major three types of Pyramids :

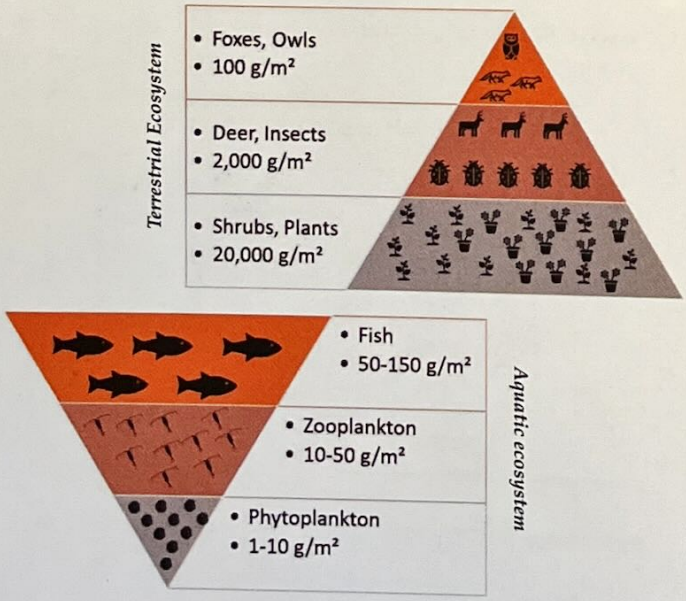
1. Pyramid of Numbers

- Depicts the number of individuals at each trophic level.
- *Typically upright* - can be seen in grassland ecosystems.
- This pyramid is *inverted* in a *Desert Ecosystem*



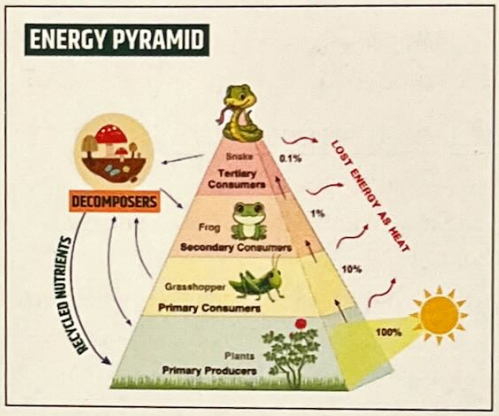
2. Pyramid of Biomass

- Shows total dry weight of organisms at each level (g/m²).
- *Usually upright but is inverted in aquatic systems.*
- *In 1938, Bodenheimer* gave the *Pyramid of Biomass* on the lines of Elton's Pyramid of Numbers.
- **Aquatic chain: Phytoplankton → Zooplankton → Small Fish → Large Fish**



3. Pyramid of Energy:

- Illustrates the rate of energy flow through trophic levels.
- *Always upright* due to the energy loss at each level in the form of heat.
- Given by *G.E. Hutchinson & Raymond Lindeman (1942).*



- **10% Rule:** On average, only about 10% of energy from one trophic level is passed to the next. The rest is lost to metabolism, heat, and waste.

POLLUTANTS AND TROPHIC LEVEL

- Non-degradable pollutants (e.g., heavy metals, pesticides) can accumulate in organisms and move through trophic levels. These movements of the pollutants involves two main processes:

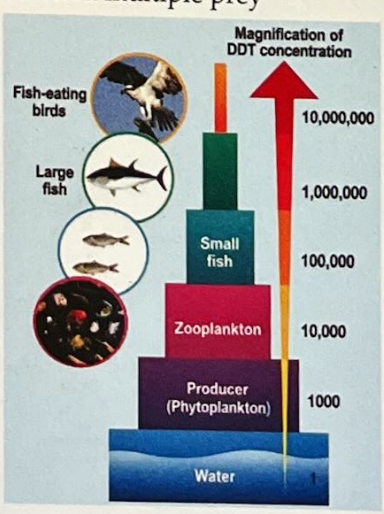
Bioaccumulation:

- Refers to the accumulation of pollutants in a food chain over time.
- Occurs when an organism absorbs a toxic substance faster than it can excrete it.

Bioremediation: use of Biotechnology to decontaminate an area.

Biomagnification:

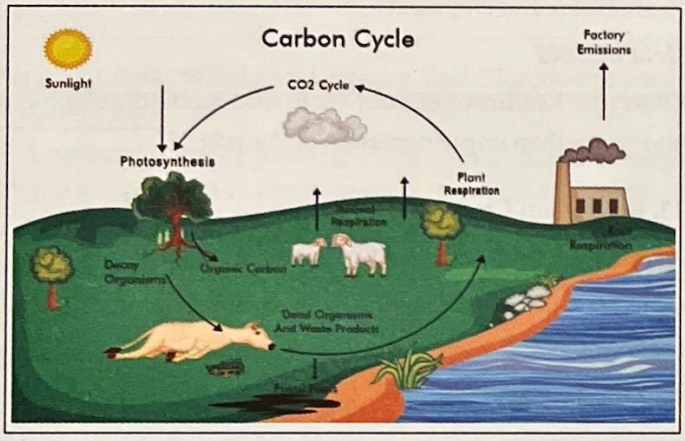
- Refers to the increasing concentration of pollutants as they move up the food chain
- Top consumers have the highest toxin levels due to accumulation from multiple prey



MAJOR BIOGEOCHEMICAL CYCLES

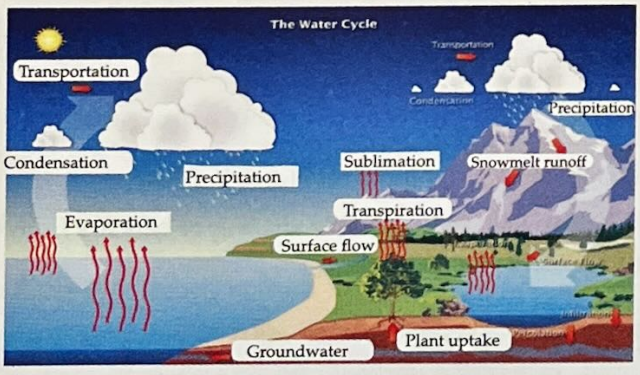
CARBON CYCLE

The carbon cycle is a biogeochemical process where carbon is exchanged among the biosphere, geosphere, hydrosphere, atmosphere, and pedosphere. Green plants absorb carbon dioxide for photosynthesis, storing carbon. When plants die, they form fossil fuels. Animals obtain carbon by consuming plants and release it back through respiration and decomposition. Burning fossil fuels in industries releases stored carbon dioxide into the atmosphere, continuing the cycle.



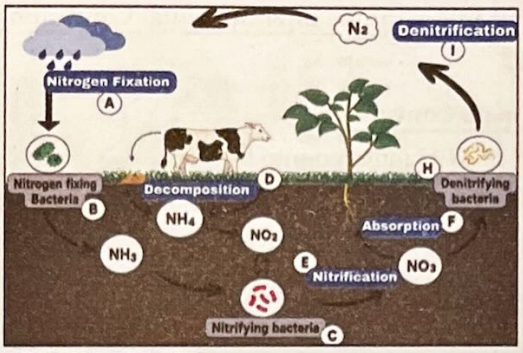
WATER CYCLE (HYDROLOGICAL CYCLE)

The water cycle is a biogeochemical process where water moves continuously through the atmosphere, land, and oceans. Water evaporates from surfaces, forms clouds through condensation, and returns as precipitation. Some of it infiltrates the ground to recharge aquifers, while the rest runs off into water bodies. Plants also release water through transpiration. This cycle ensures the distribution and renewal of freshwater across ecosystems.



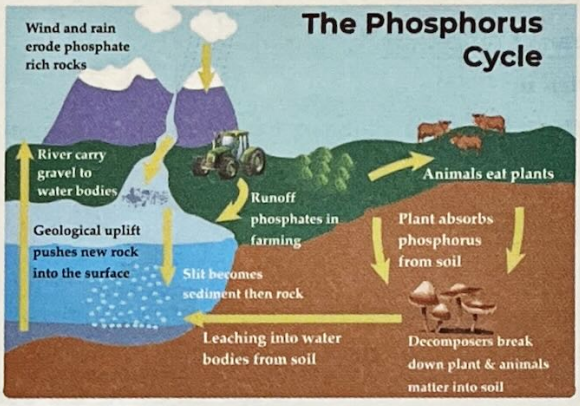
NITROGEN CYCLE

The nitrogen cycle involves the transformation and movement of nitrogen among the atmosphere, soil, and living organisms. Atmospheric nitrogen is fixed by lightning or nitrogen-fixing bacteria into usable forms like ammonia and nitrates. Plants absorb these compounds, which are passed through the food chain. Decomposition and excretion return nitrogen to the soil, while denitrifying bacteria release nitrogen gas back to the atmosphere, completing the cycle



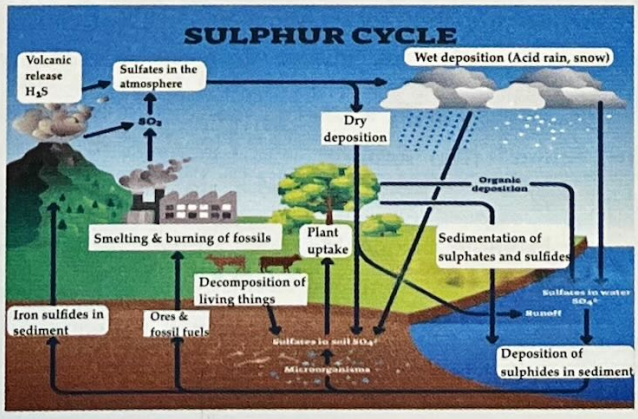
PHOSPHORUS CYCLE

The phosphorus cycle describes the movement of phosphorus through rocks, soil, water, and organisms. Unlike other cycles, it does not involve the atmosphere. Phosphorus is released from rocks by weathering and taken up by plants. Animals obtain it by eating plants.When organisms die or excrete waste, phosphorus returns to the soil and may eventually form sedimentary rock again. It is essential for DNA, RNA, and energy transfer in cells.



SULPHUR CYCLE

The sulphur cycle traces the movement of sulphur through the atmosphere, lithosphere, and biosphere. Sulphur is released into the air from volcanic eruptions, fossil fuel combustion, and decay of organic matter. It falls back to the earth via rain as sulphuric acid, is absorbed by plants, and then moves through the food web. Decomposition and microbial processes return sulphur to the soil and atmosphere, influencing both ecosystems and acid rain formation.



Important International Environmental Conventions and Protocols

1. Minamata Convention

Adopted in: 2013 (entered into force in 2017)

Objective: Protect human health and the environment from mercury emissions and releases.

2. Stockholm Conference

Held in: 1972

Objective: *First major UN conference* on the human environment; raised global awareness and led to the creation of UNEP.

3. Nairobi Declaration

Adopted in: 1982

Objective: Strengthen UNEP's role and reaffirm commitments made in the Stockholm Conference.

4. Vienna Convention

Adopted in: 1985

Objective: Protection of the ozone layer from human-made chemicals.

5. Montreal Protocol

Adopted in: 1987

Objective: Phase out production and consumption of ozone-depleting substances.

Kigali Amendment (2016): Added HFCs to the list of controlled substances.

6. Helsinki Declaration

Adopted in: 1964 *(latest revision: 2013)*

Objective: Set ethical principles for medical research involving human subjects.

7. Basel Convention

Adopted in: 1989

Objective: Control and reduce transboundary movements of hazardous wastes and ensure their environmentally sound disposal.

8. Earth Summit (Rio Summit)

Held in: 1992

Objective: Promote sustainable development; resulted in Agenda 21, Rio Declaration, and UNFCCC.

9. UN Convention to Combat Desertification (UNCCD)

Adopted in: 1994

Objective: Combat desertification and drought, particularly in Africa; ensure sustainable land management.

10. Kyoto Protocol

Adopted in: 1997

Objective: Legally binding commitment to reduce greenhouse gas emissions in developed countries.

11. Stockholm Convention

Adopted in: 2001 (entered into force in 2004)

Objective: Eliminate or restrict the production and use of persistent organic pollutants (POPs).

12. Johannesburg Declaration *(World Summit on Sustainable Development)*

Held in: 2002

Objective: Reaffirm commitment to sustainable development and strengthen implementation of *Agenda 21*.

13. Rotterdam Convention

Adopted in: 1998 (entered into force in 2004)

Objective: Promote shared responsibilities in international trade of hazardous chemicals and pesticides through prior informed consent.

14. Cartagena Protocol on Biosafety

Adopted in: 2000 (entered into force in 2003)

Objective: Protect biological diversity from potential risks posed by living modified organisms (LMOs).

15. Bonn Convention *(Convention on Migratory Species-CMS)*

Adopted in: 1979 (entered into force in 1983)

Objective: Conserve migratory species of wild animals across their range.

16. Nagoya Protocol

Adopted in: 2010 (entered into force in 2014)

Objective: Fair and equitable sharing of benefits from the utilization of genetic resources.

17. Paris Agreement

Adopted in: 2015 (entered into force in 2016)

Objective: Strengthen global response to climate change by limiting global warming to well below 2°C above pre-industrial levels.

Linked to: *COP21 (21st Conference of the Parties to UNFCCC).*

Conservation Sites

• Areas that are legally protected to preserve their natural or cultural significance are called *"protected areas"*, which can include *national parks, wildlife sanctuaries, biosphere reserves,* and *cultural heritage sites*.

Different Conservation Sites:

In-Situ Conservation	*Ex-Situ Conservation*
Conserving the wildlife in the natural habitat	Conserving the wildlife outside their natural habitat
Eg. National Parks, Wildlife Sanctuary, Biosphere Reserves	**Eg.** Zoo/Zoological gardens, Aquarium, Botanical gardens

National Park, Wildlife Sanctuary, and Biosphere Reserve

National Park

• A national park is a protected area of land that is managed by the government to preserve the natural environment.

• They prohibit activities like hunting, deforestation, and industrialisation.

Wildlife Sanctuary

• A wildlife sanctuary is a protected area of land where ***plants*** (flora) and ***animals (fauna)*** can live and thrive.

• It is established to protect ***endangered species*** and their ***habitats***.

• They can be owned by the ***government*** or a ***nonprofit organization***.

Note: A ***Wildlife Sanctuary*** mainly focuses on protecting specific species of animals and birds in their ***natural habitat*** with limited human interference, whereas a ***National Park*** aims to conserve the ***entire ecosystem***, including flora, fauna and landscape with stricter protection measures.

Biosphere Reserve

• These are large area of protected land for ***conservation of wildlife, plants, animals,*** and ***traditional life*** of the ***tribals*** living in the area.

Biosphere Reserve Zones

• There are three zones of Biosphere: Core zone, Buffer zone and Transition zone

• **Core Zone:** In this zone, ***human intervention is strictly prohibited*** to preserve the natural ecosystem and its biodiversity.

• **Buffer Zone:** The buffer zone is the area surrounding the core zone. ***Humans are permitted to conduct only research and education related work***. These activities should not interfere with the core area's conservation goals.

• **Transition Zone:** It is a biosphere reserve's periphery where human activities such as cropping, recreation, forestry, and settlements are permitted with the cooperation of reserve management and local people.

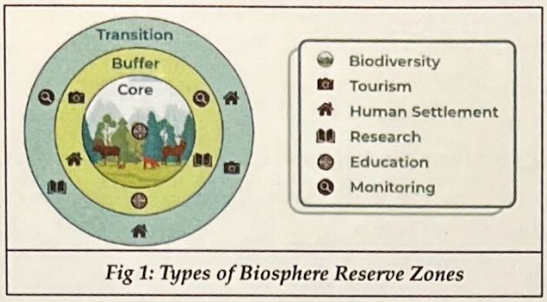


Fig 1: Types of Biosphere Reserve Zones

International Union for Conservation of Nature (IUCN)

• HQ: Gland, Switzerland

• Established in: 1948

• IUCN maintains a ***Red Data Book*** (it records endangered species to raise awareness and protect biodiversity).

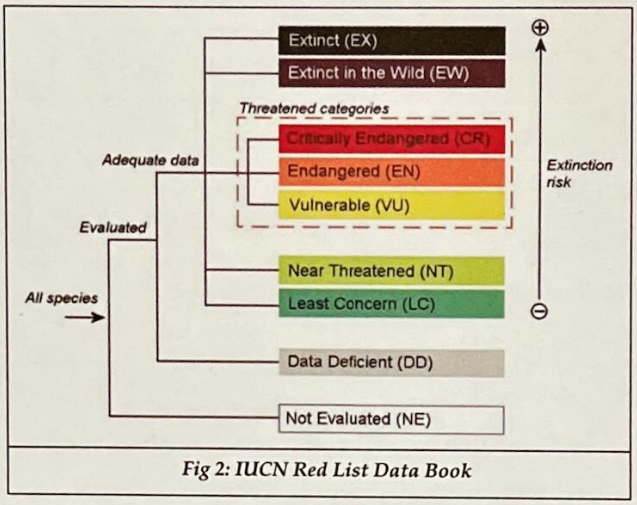


Fig 2: IUCN Red List Data Book

Wildlife Protection Act 1972

• It is an Act of the Parliament of India enacted for the protection of plants and animal species.

• The act has played a critical role in conserving the country's diverse wildlife.

Schedules under this Act

• Total: ***6 schedules***

• Schedule I: It covers ***endangered species*** that need rigorous protection → Black buck, snow leopard, Asiatic cheetah, etc.

• Schedule II: Animals under this list are also accorded high protection with the ***prohibition on their trade*** → Indian cobra, Assam Macaque, Himalayan black bear, etc.

• Schedule III & IV: Species that are ***not endangered*** → Sambar deer, chital, etc. (Schedule III) and Crabs, Flamingo, etc. (Schedule IV).

• Schedule V: This schedule contains animals that are considered as ***vermin*** (small wild animals that carry disease and destroy plants and food) → Fruit bat, rats, common crow, etc.

• Schedule VI: It provides for regulation in the cultivation of a ***specified plant*** and restricts its possession, sale, and transportation → Blue orchid, red orchid, pitcher plants, etc.

Wildlife species were originally placed in *6 schedules* with different protection levels (Schedule I, II, III, IV, V, VI).

However, the 2022 amendment act reduced the number of schedules to *four*:

- Schedule I: Animal Species with the highest level of protection

E.g. Dugong (sea cow),Gharial,Great Indian Bustard.

- Schedule II: Animal Species with lower level of protection

E.g. King Cobra,Flying Squirrels

- Schedule III: Protected Plant species
- Schedule IV: Specimen listed under CITES Appendices

Vermin provision: The Government of India can declare any wild animal not in Schedule I & II as vermin by notification.

Power to revise schedules: The Government of India has the authority to add, delete, or transfer species entries between schedules.

CONSERVATION SITES

Representation

- NP: National Parks.
- WLS: Wildlife Sanctuary.
- BR: Biosphere Reserve.
- RS: Ramsar Site.
- TR: Tiger Reserve.
- BS: Bird Sanctuary.
- Lakes/Jheel.

Ladakh

- **Hemis NP, Karakorum (Nubra Shyok) WLS, Changthang WLS (features Tso Moriri lake).**

Jammu and Kashmir

- **TRICK:** *Salim* ने *Do Gram Kish* दी *Kazi kol*
- *Salim Ali NP, Dachigam NP, Kishtwar NP, Kazinag NP.*
- **Animals found in Kashmir:** Hangal (Kashmir stag), snow leopard, etc.

Himachal Pradesh

- **TRICK:** *Inder Him* पे *Khir* खा रहा था और *Pin* से *Sim* निकल रहा था।
- *Inderkilla* NP, *Great Himalayan* NP, *Khirganga* NP, *Pin Valley* NP, *Simbalbara* NP.

Uttarakhand

- **TRICK:** *Rajaji Flowers* लेके *Jimmy Devi* से मिलने पहुंचे *Pashu Vihar me*।
- *Rajaji* NP, *Valley of Flowers* NP, *Jim Corbett* NP, *Nanda Devi* NP, *Gobind Pashu Vihar* NP, *Gangotri* NP.
- **First National Park of India:** *Jim Corbett National Park (1936).*
- *Project Tiger* was launched from Jim Corbett NP in *1973*.
- *Project Elephant* was launched on *1992*.
- *Project Snow Leopard* was launched from Govind Pashu Vihar NP-WLS in 2009.

Uttar Pradesh

- **Pilibhit TR, Dudhwa NP-TR, Nawabganj BS, Amangarh TR, Ranipur TR - WLS, Chambal WLS, Chandra Prabha WLS.**

Bihar

- **Valmiki NP-TR, Nakti Dam WLS, Nagi WLS.**
- *Nagi* and *Nakti* were declared *81st* and *82nd Ramsar Sites* on *World Environment Day, 5th June 2024*.

Madhya Pradesh

- **TRICK:** *Sanjay Madhav Paan* खाके अपने *Bandhu Kanha* से मिलने *Paanch* पैसे लेके *Saat* बजे *Van* पहुँचे।
- *Sanjay Gandhi* NP, *Madhav* NP, *Panna* NP, *Bandhavgarh* NP, *Kanha* NP, *Panchmarhi* NP, *Satpura* NP, *Van Vihar* NP,

Kuno NP-WLS, Pench NP-TR, Chambal WLS, Ghughua NP, Mandla Plant Fossil NP, Bori WLS, Dinosaur Fossil NP.

- Madhya Pradesh has the *most no. of National Parks*.
- *Cheetahs* were brought from *Namibia* to *Kuno NP* as a part of *Project Cheetah*.
- Chambal WLS: Famous for *Gharial* and *Red-crowned roofed turtle*.

Chhattisgarh

- **Sanjay (Guru Ghasidas) NP-TR, Achanakmar NP-TR, Udanti-Sitanadi TR, Kanger Valley NP, Indravati NP.**

Rajasthan

- **TRICK:** *Raja Mukund* **is** *Running* **in** *Saree* **in** *Desert kyunki Ram* **Ne** *Vish* **Pi Liya.**
- *Mukundra Hills* NP, *Ranthambore* NP, *Sariska* TR, *Desert* NP, *Keoladeo Ghana* NP, *Ramgarh Vishdhari* TR.

• **State Bird of Rajasthan:** Great Indian Bustard *(critically endangered)*.

Gujarat

• **TRICK: Gujarat** *Me Meri Black Van* **बीच पर** *Gir Gai*.

• *Marine* NP, *Blackbuck* NP, *Vansda* NP, *Gir* NP

• *Gir NP* is the only habitat of the *Asiatic Lion* in the world.

India is the only country to have both Tigers and Lions.

Maharashtra

• **Pench NP-WLS, Gugamal NP, Nawegaon NP-TR, Tadoba-Andheri NP (oldest NP of Maharashtra), Tansa WLS, Chandoli NP, Sanjay Gandhi (Borivilli) NP.**

• **Pench Tiger Reserve in Maharashtra is India's first Dark Sky Park.**

Andhra Pradesh

• **Nelapattu BS, Papikonda NP, Coringa WLS, Rajiv Gandhi (Rameswaram) NP, Sri Venkateswara NP-WLS.**

• *Seshachalam* is home to certain endemic species such as *Red Sandlers* and *Slender Loris*.

Telangana

• **Kawal TR, Pakhal WLS, Amrabad TR, Pocharam WLS, Kasu Brahmananda Reddy NP, Mahaveer Harina Vanasthali NP, Mrugavani NP.**

Karnataka

• **TRICK:** *Bandi Nagar* **में** *Kude* **का एक** *Ansh* **भी** *Ban* **है.**

• *Bandipur* NP, *Nagarhole* NP (Rajiv Gandhi NP), *Kudremukh* NP, *Anshi* NP, *Bannerghatta* NP,

Dandeli WLS, Brahmagiri WLS (Kodagu district), Kali TR.

• *Gaur* is a domestic cattle protected at *Nagarhole* and *Bandipur*.

Kerala

TRICK: National Parks that have *"Shola"* in their names belong to Kerala.

• **Anamudi Shola NP, Mathikettan Shola NP, Pampadum Shola NP, Wayanad WLS, Silent Valley NP, Eravikulam NP, Periyar NP, Neyyar WLS, Vembanad-Kol Wetland (Pamba river flows here) Peppara WLS.**

Tamil Nadu

• **Guindy NP, Mudumalai NP-TR, Annaimudi NP, Mukurthi NP, Gulf of Mannar Marine NP-BR, Indira Gandhi NP, Palani NP.**

• *Annamalai NP-TR* falls in the *border of Tamil Nadu and Kerala*.

• *Dugong* (sea cow) and *Sea turtles* are found in *Gulf of Mannar BR*.

Odisha

• **Simlipal NP-TR (Habitat for Melanistic TR), Bhitarkanika NP-WLS, Satkosia TR, Chilika WLS, Nalbana BS.**

• *Bhitarkanika WLS* is famous for *estuarine crocodiles*.

Jharkhand

• **Betla NP, Palamu TR.**

West Bengal

• **TRICK:** *WB* **की** *Jalpari Nora* **बड़ी** *Sundar Gori* **है और** *Single* **भी क्योंकि** *Boxer Hai*.

• *Jaldapara* **NP,** *Neora Valley* **NP,** *Sunderban* **NP,** *Gorumara* **NP,** *Singalila* **NP,** *Buxa* **NP.**

• **Sunderban NP: Home to Royal Bengal Tigers.**

Sikkim

• **Kanchenjunga NP-BR.**

Assam

• **TRICK:** *Mana Na Meri Kazi* **करवा दी** *Mona Ki* **शादी** *Aurang Sheikh* **के साथ.**

• *Manas* NP, *Nameri* NP, *Kaziranga* NP, *Raimona* NP, *Onang* NP, *Dibru-Saikhowa* NP,

Dihang NP, Dihing Patkai National Park.

• *Kaziranga NP has the highest population of one-horned rhinoceros.*

Meghalaya

• **Nokrek NP, Balphakram NP.**

Manipur

• **Keibul-Lamjao NP.**

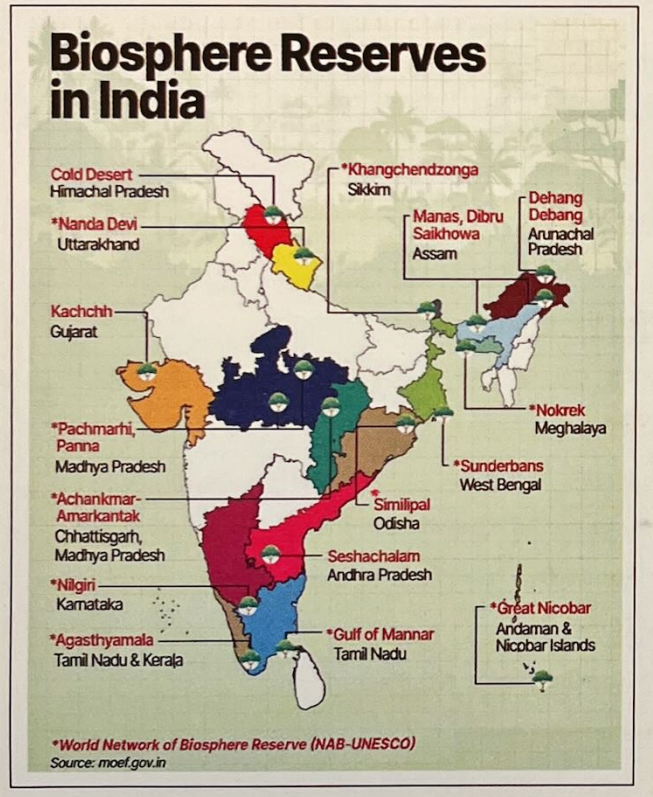
• State animal of Manipur: *Sanghai deer* (seen mostly in KeibulLamjao NP).

• Keibul-Lamjao NP is *world's only floating National Park* that is located in Loktak Lake (*phumdis* is seen here). This National Park is also famous for *Eld's deer* species.

Andaman and Nicobar

• **Saddle Peak NP, North Button Island NP, Middle Button Island NP, South Button Island NP, Rani Jhansi Island NP, Mount Harriett NP, Mahatma Gandhi Marine NP.**

BIOSPHERE RESERVES IN INDIA



• First Reserve Forest of India: *Satpura National Park* (also known as Satpura Tiger Reserve)

• Total Biosphere Reserve: *18*

• Oldest BR: *Nilgiri BR* (spread across *Kerala, Tamil Nadu, Karnataka*)

- Largest BR: *Great Rann of Kutch*

- Cold Desert NP: *Himachal Pradesh*

Under UNESCO's, MAB Programme(1971) → *Biosphere Reserve in India*

1. *Nilgiri (1st under MAB)*
2. *Gulf of Mannar*
3. *Sundarban*
4. *Nanda Devi*
5. *Nokrek*
6. *Pachmarhi*
7. *Simlipal*
8. *Achanakmar-Amarkantak (Chhattisgarh-Madhya Pradesh border)*
9. *Great Nicobar*
10. *Agasthyamalai*
11. *Kangchenjunga (added in 2008)* → *Highest mixed World Heritage Site in UNESCO*
12. *Panna Biosphere Reserve*
13. *Cold Desert Biosphere Reserve 2025 recently added*

*MAB: Man and Biosphere Reserve

STATIC
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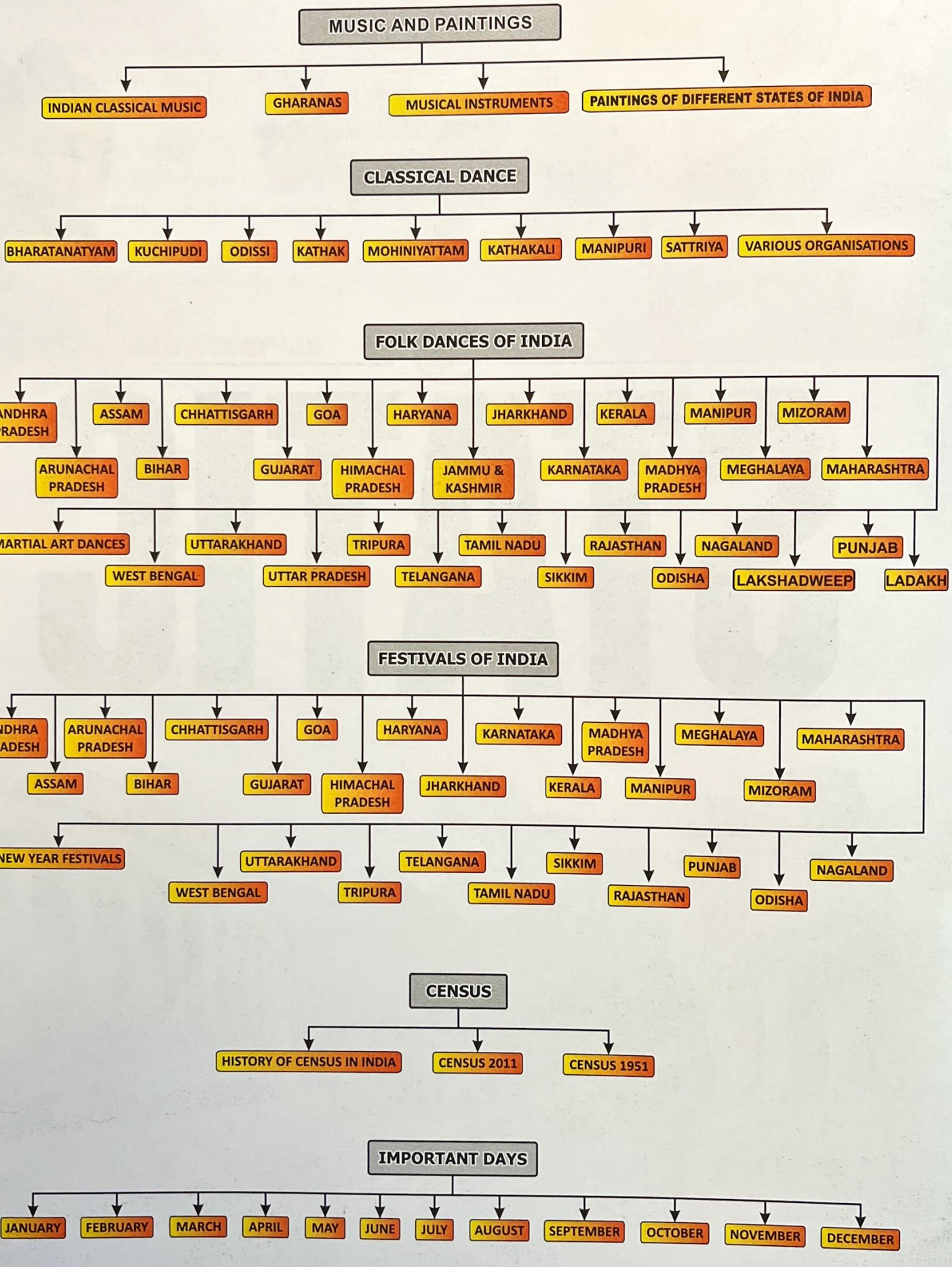
INDIAN POLITY
INDIAN ECONOMY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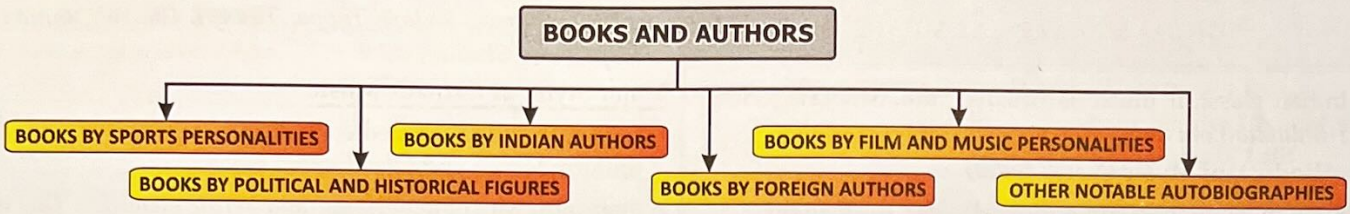
BOOKS AND AUTHORS
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BOOKS BY INDIAN AUTHORS
BOOKS BY FILM AND MUSIC PERSONALITIES
BOOKS BY POLITICAL AND HISTORICAL FIGURES
BOOKS BY FOREIGN AUTHORS
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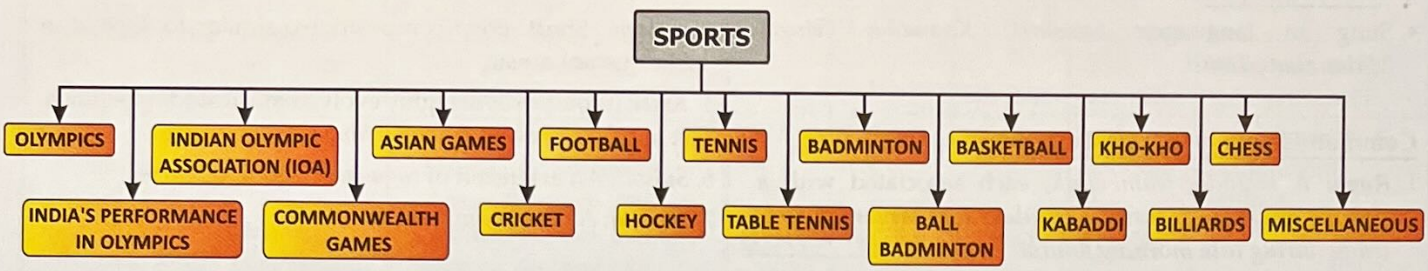
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HOCKEY
TABLE TENNIS
BALL BADMINTON
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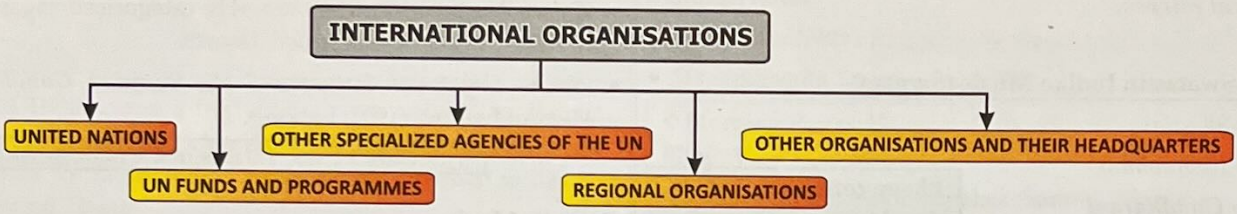
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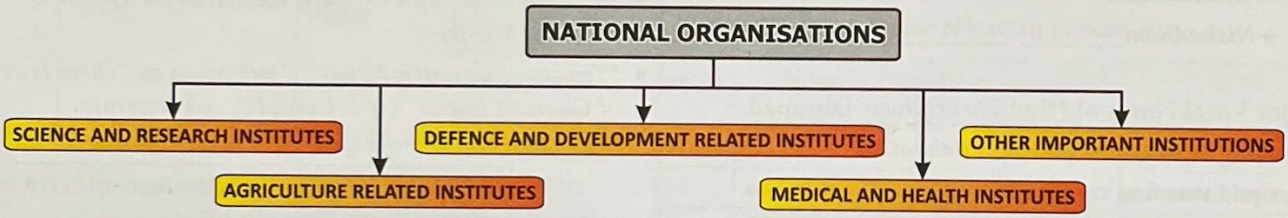
REGIONAL ORGANISATIONS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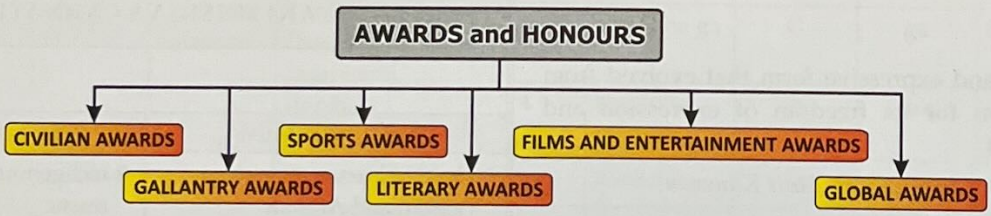

AWARDS and HONOURS
CIVILIAN AWARDS
SPORTS AWARDS
FILMS AND ENTERTAINMENT AWARDS
GALLANTRY AWARDS
LITERARY AWARDS
GLOBAL AWARDS

INDIAN CLASSICAL MUSIC

- Indian classical music is divided into two categories: *Hindustani music* and *Carnatic music*.

1. **Hindustani Music** *(North India)*

- Sung in languages: *Hindi, Braj, Avadhi, Rajasthani, Marathi.*

2. **Carnatic Music** *(South India)*

- Sung in languages: *Sanskrit, Kannada, Telugu, Malayalam, Tamil.*

Common Elements in Both Traditions

1. *Raga:* A *melodic framework*, each associated with a specific emotion or time of the day. ***E.g. Miyan ki Todi (sung during late morning hours).***
2. *Taal*: A rhythmic framework based on *cyclic time units*.
3. *Sruti*: The smallest measurable difference between *musical pitches*.

7 Basic Swaras in Indian Music (Sargam)

- *Sa → Shadjam*
- *Re → Rishabham*
- *Ga → Gandharam*
- *Ma → Madhyamam*
- *Pa → Panchamam*
- *Da → Dhaivatham*
- *Ni → Nishadham*

Bhoop corresponds to the "Mohanam Ragam" of carnatic music.

3 Major Vocal Forms of Hindustani Music Dhrupad

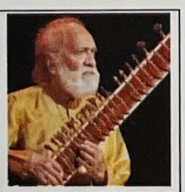
- It is sung with a *Tanpura* and *Pankhawaj*.
- Dhrupad was first composed by *Miyan Tansen*.
- It was propounded by *Dagar family* and *Darbhanga Gharana.*

Khayal

- A more lyrical and expressive form that evolved from *Dhrupad*, known for its freedom of expression and romantic themes.
- Khayal was first composed by *Amir Khusrau*.

Tarana

- It is performed towards the *end of concert*.
- It is used to convey the mood of elation.
- *Tillana of Carnatic music* is based on this.



***Lighter vocal forms in Hindustani classical music, often considered semi-classical, include Dhamar (associated with Dhrupad), Kajari, Tappa, Thumri, Ghazal, Bhajan, Tripal, and Chaiti.*

Major Styles of Carnatic Music

1. *Gitam:* A simple melodic extension of the *raga* with a uniform tempo and introductory piece.
2. *Svarajati:* Mix of *devotional* and *heroic elements*. This is learnt after a course of *Gitam*.
3. *Kirtanam*: It comprises of *devotional songs.*
4. *Tillana*: Short, crisp compositions, similar to *Tarana* in Hindustani music.
5. *Kriti*: It comprises of highly evolved musical compositions. It is a *development from Kirtana*.
6. *Suladi*: An extension of *raga-based* compositions.
7. *Padam*: A love poem/tempo.

Important Personalities in Indian Classical Music

Hindustani Music

- *Vishnu Narayan Bhatkhande*→He categorised ragas into *10* basic musical scales called *Thaats*.
- *Vishnu Digambar Paluskar*→ He founded *Gandharva Mahavidyalaya* (1901, Lahore).

There are 7 basic Talams in Carnatic music.

Carnatic Music

- *Purandar Das* → He is considered as the *Father of Carnatic Music.*
- *M. S. Subbulakshmi* → She is known as the *Queen of Carnatic Music.*
- *"Trinity of Carnatic Music"* also known as *"Three Jewels of Carnatic Music"* (18th Century) → *Tyagaraja, Muthuswami Dikshitar*, and *Syama Sastri*.

M. S. Subbulakshmi was the first musician to receive Bharat Ratna in 1998.

HINDUSTANI MUSIC VS CARNATIC MUSIC

Hindustani Music	Carnatic Music
❖ Have influence of Arab, Persian and Afghan	❖ Indigenous system of music
❖ Scope provided to artists for variation and improvisation	❖ Less scope of improvisation
❖ several sub-styles which lead to emergence of 'Gharanas'	❖ Only one particular prescribed style of singing
❖ 6 major ragas	❖ 72 melakartas, ragas and janya ragas
❖ Instruments are equally important as vocals	❖ More emphasis given on vocal music

Hindustani Music	Carnatic Music
❖ Main emphasis on Ragas	❖ Mainly based on Tala or Taal
❖ Mainly associated with north india	❖ Mainly prevalent in south india
❖ Major instrument used: Tabla, Sarangi, Sitar and Santoor	❖ Instruments used: Veena, Mrindangum and Mandolin
❖ Khayal, Dhrupad, and Tappa are vocal forms associated with the Hindustani music tradition of North India.	❖ Kriti , Varnam and Kirtan are vocal forms associated with the Carnatic tradition of South India.
❖ There are 12 main Talas in Hindustani music, which include Keherwa, Dadara, Rupak, Dhumali, Matta, Jhapatal, Rudra Taal, Ekataal, Deepachandi, Chautal, Teentaal, Tilawada.	❖ There are 7 main Talas (Saptatalas) in Carnatic music. These are : Dhruva, Mathya, Rupaka, Jhampa, Triputa, Ata, and Eka.

THAATS & RAGAS

The 10 Thaats were introduced and formalized by ***Pandit Vishnu Narayan Bhatkhande.*** A Thaat acts as a parent scale or family for ragas, and most ragas are classified under 10 structured Thaats.

Thaat	Swaras (Notes)	Time	Feature	Associated Ragas
Bilawal	S R G M P D N	Morning	Light/ joyful	Alhaiya Bilawal, Yamani Bilawal, Shankara, Hamsadhwani, Bihag
Kalyan	S R G M# P D N	Early night	Serene/ devotional	Yaman, Bhupali, Hindol, Kedar, Kamod, Shyam Kalyan
Khamaj	S R G M P D n	Late night	Light-hearted/ romantic	Khamaj, Desh, Tilak Kamod, Rageshri, Jaijaiwanti, Jhinjhoti
Kafi	S R g M P D n	Late evening	Gentle/ romantic	Kafi, Bageshri, Bhimpalasi, Dhani, Shivranjani, Pilu
Bhairav	S r G M P d N	Early Morning	Serious / devotional	Bhairav, Ahir Bhairav, Jogiya, Nat Bhairav, Gauri, Vibhas
Marwa	S r G M# D N	Twilight/ dusk	Anxious/ deep	Marwa, Puriya, Bhatiyaar, Sohoni, Bibhas
Poorvi	S r G M# d N	Late evening /twilight	Serious/ devotional	Poorvi, Shree, Puriya Dhanashree, Basant, Lalit
Asavari	S R g M P d n	Early Morning	Calm/devotional	Asavari, Jaunpuri, Desi, Darbari Kanada, Adana
Bhairavi	S r g M P d n	Morning	Often used to close concerts	Bhairavi, Malkauns, Bilaskhani Todi, Kaunsi Kanada
Todi	S r g M# d N	Morning	Intense/ emotional.	Todi, Gujari Todi, Madhuvanti, Multani

QUICK NOTE ON NOTATION:

In the table above:

- ***Capital letters*** (S, R, G, M, P, D, N) represent Shuddha (natural) notes.
- ***Lowercase letters*** (r, g, d, n) represent Komal (flat) notes.
- ***M#*** represents Teevra (sharp) Ma.

❖ Morning Ragas: Bhairav, Todi, Ahir Bhairav, Nat Bhairav.

❖ Afternoon Ragas: Bhimpalasi, Sarang, Multani.

❖ Ragas: Yaman, Bageshri, Puriya Dhanashree.

❖ Night Ragas: Darbari Kanada, Malkauns, Chandrakauns.

Indian Classical Music Notation Guide

Note	Note Name	Notation ID	Sol-fa Syllable	Full Name
1	sa	S	sa	shadja
2b	komal re	r	re	komal rishabha
2	shuddha re	R	re	shuddha rishabha
3b	komal ga	g	ga	komal gandhaara
3	shuddha ga	G	ga	shuddha gandhaara
4	shuddha ma	m	ma	shuddha madhyama
4#	tivra ma	M	ma	tivra madhyama
5	pa	P	pa	panchama
6b	komal dha	d	dha	komal dhaivata
6	shuddha dha	D	dha	shuddha dhaivata
7b	komal ni	n	ni	komal nishaada
7	shuddha ni	N	ni	shuddha nishaada
8	sa	S'	sa	shadja

❖ ***Raga Shankara :***

➢ It is performed during the night, specifically the second pahar of the night (typically between 9:00 PM to 12:00 AM or 10:00 PM to 1:00 AM).

➢ The raga is associated with the energy of Lord Shiva.

➢ It belongs to the Bilawal Thaat.

➢ It is traditionally rendered, conveying a meditative and devotional mood.

❖ ***Raga Bageshree :***

➢ It is typically performed during the night, specifically in the second pahar of the night. This raga belongs to the Kaafi Thaat.

❖ ***Raga Jaunpuri :***

➢ This raga is derived from the Asavari (or Asarvi) Thaat.

➢ It is known for conveying a sense of emotional depth and devotion.

➢ Performed in late morning sessions and conveying gentle, devotional moods.

❖ ***Raga Bhairav :***

➢ It is derived from the Bhairav Thaat.

➢ It is performed in the early morning and is known as the "King of Morning Ragas".

➢ The raga evokes a devotional, majestic, and serious mood.

➢ It is associated with Lord Shiva.

❖ ***Raga-Based Performances :***

➢ Thumri, Dhrupad, and Prabandha are all traditional forms of raga-based performances in Indian classical music.

➢ **Thumri :** The thumri is very lyrical in its structure and presentation. Thumri is a love song and hence the textual beauty is very important.

➢ Sonata is a structural form associated with Western classical music.

❖ ***Structure of Dhrupad :*** Dhrupad has four parts and the dhrupad proper is a song in four parts. The four parts of a dhrupad composition (also known as tuks or segments) are:

1. Sthayi (or Asthayi): The base/refrain, covering the lower and middle octaves.
2. Antara: Covers the middle and higher octaves.
3. Sanchari: The development phase, using all three octaves.
4. Abhoga: The concluding section.

❖ ***Raga Vivodha and Pandit Somnath :*** In the text Raga Vivodha, Pandit Somnath defined a raga through two main components.

➢ The first is Devamaya Swarupa, which represents the ethos or spiritual/emotional form.

➢ The second is Nadamaya Swarupa (also known as Swarlakshana), which represents the tonal structure of the raga.

❖ ***Achal and Chal Swaras :*** In the 7 basic notes, there are two categories of swaras: 'Achal' and 'Chal' .

➢ Achal Swaras (Fixed): "Sa " and "Pa " are Achal swaras and are always "Shuddha " (pure). They never change position.

➢ Chal Swaras (Movable): These notes have variants categorized into "Komal" (flat) and "Teevra " (sharp). All other swaras except sa & pa are Chal Swaras.

❖ ***Types of Jati in Rhythm (Carnatic Music) :*** There are 5 main Jatis in the rhythmic structure:

➢ Tishra Jati (3 beats): A pattern based on three, often performed as 1+2 or 3.

➢ Chaturashra Jati (4 beats): A pattern based on four, commonly used as the default in many talas (1+3 or 2+2).

➢ Khanda Jati (5 beats): A pattern based on five (2+3 or 5).

➢ Mishra Jati (7 beats): A pattern based on seven (3+4 or 3+2+2).

➢ Sankeerna Jati (9 beats): A pattern based on nine (4+5 or 3+2+4)

❖ ***Jati in Melodic Structure (Range Classification) :*** In Melodic terms, Particularly within Hindustani music, Jati classifies ragas by the number of notes (Svaras) in their scale:

➢ Audav jati: Pentatonic scales containing five notes.

➢ Shadav Jati: Hexatonic scales containing six notes.

➢ Sampurna Jati: Heptatonic scales containing all seven notes.

➢ Mixed Jati (Mishra): Combination, such as Audav-Sampurna (5 in aroh, 7 in avroh)

❖ ***Rhythmic Cycles (Talas) :*** In Indian classical music, the rhythmic cycle is referred to as "Tala " . Few specific Talas and their beats:

➢ Adi Tala: Consists of 8 beats.

➢ Mishra Chapu: Consists of 7 beats.

➢ Rupak Tala: Consists of 3 or 6 beats.

❖ ***Teentaal :***

➢ Teentaal consists of 16 beats (matras).

➢ These 16 beats are divided into four sections of four beats each (4-4-4-4).

➢ A clap (Taali) falls on the 1st, 5th, and 13th beats.

➢ An empty beat (Khali) falls on the 9th beat.

❖ ***Saptak Notation System :***

➢ Dot above (S): Taar Saptak (High Octave).

➢ Dot below (S): Mandra Saptak (Low Octave).

➢ No dot (S): Madhya Saptak (Middle Octave).

❖ ***Gamaka :***

➢ Gamaka refers to any graceful turn, curve, or oscillation applied to a single note or between notes.

➢ The specific type of Gamaka used by gliding from one note to another is called Meend, which is commonly used in Hindustani classical music.

❖ ***Khayal :***

➢ It is a romantic and highly ornamented style of singing.

➢ The musical compositions in Khayal are called "Bandish".

❖ ***Abhinaya Darpana :*** It was composed by Nandikeshwara. It is also famously known as the "Mirror of Gesture ".

➢ Nritta: Pure dance (without expressive emotions).

➢ Nritya: Expressive dance (involving emotions and expressions).

❖ ***Venkat Mukhi Swami :***

➢ He is regarded as the grand theorist of Carnatic music.

➢ He developed the Raga classification system and the Melakarta system.

➢ His famous musical compositions include Chaturdandi Prakashika.

❖ ***Sarangadeva :***

➢ Sarangadeva composed the Sangeeta Ratnakara.

➢ He was a court scholar for King Singhadeva II of the Yadava dynasty (whose capital was Devagiri).

➢ The Sangeeta Ratnakara is divided into seven chapters, collectively called Saptadhyay

❖ Annamacharya wrote over 32,000 songs promoting devotion and equality.

❖ In Haripala's "Sangeeta Sudhakara" , written in the 14 century A.D., the terms Carnatic and Hindustani are found for the first time.

❖ The advent of Purandaradasa, in the year 1484 marked a very important landmark in the development of Carnatic music.

❖ Matanga is the composer of the treatise of music Brihaddesi.

GHARANAS (SCHOOL OF MUSIC)

Gwalior Gharana

- It is considered as the ***oldest*** and ***most influential*** Khyal Gharana in Indian classical music.
- It is said to have emerged during the reign of Mughal Emperor → ***Akbar*** (16th Century).
- ***Ramtanu Pandey***, later known as ***"Miyan Tansen"*** was one of the first and most famous vocalists of this Gharana (Akbar gave the honorific title ***"Miyan"*** to him).
- Founders: ***Hassu Khan, Haddu Khan*** & ***Nathoo Khan, Nathan Pir Baksh.***
- Exponents: ***Raja Bhaiya Poonchwale, Krishnarao Shankar, Pt. Omkarnath Thakur, Veena Sahasrabuddhe, Vishnu Digambar Paluskar, Bade Mohammad Khan.***

Gwalior Gharana contemporary artist Sharad Sathe performing.

- **Tansen initially served in the court of Raja Ramchandra Singh of Rewa.**
- **Guru of Tansen: Saint Haridas (he started Dagar Gharana).**

MAJOR GHARANAS

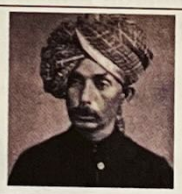
Kirana Gharana *(Uttar Pradesh)*

- This Gharana is known for its ***perfect note rendition*** (Sargam).
- ***Founders:*** ***Abdul Karim Khan*** and ***Abdul Wahid Khan.***

Exponents

Pt. Bhimsen Joshi *(from Karnataka)*

- He received: ***Bharat Ratna (2008), Padma Vibhushan (1999), and Padma Bhushan (1985).***
- ***Sawai Gandharva (Guru of Pt. Bhimsen Joshi), Gangubai Hangal, Prabha Atre, Manik Varma, Chhannulal Mishra.***



Abdul Karim Kha

Abdul Wahid Khan

Kumara Gandharva *(from Karnataka)*

- Original name: ***Shivaputra Siddaramaiah Komkalimath.***
- He ***refused*** to be associated with any Gharana

Patiala Gharana

- It was inspired and influenced by four Gharanas: ***Delhi, Rewa, Gwalior, Jaipur Gharanas.***
- This Gharana is known for its ***Ghazal, Khayal,*** and ***Thumri*** styles.
- Founder: ***Mian Kallu*** (he played Sarangi). "Later popularised by Ustad Ali Baksh Khan and Ustad Fateh Ali Khan" —prominent figures closely identified with this Gharana's rise.

- Propounded by: *Ustad Bade Fateh Ali Khan* and *Ustad Ali Baksh Jarnail Khan.*
- Exponents: *Bade Ghulam Ali Khan Begum Akhtar, Ajay Chakraborty, Naina Devi, Parveen Sultana, Lakhsmi Shankar, Amanat Ali Khan.*

Ustad Bade Fateh Ali Khan

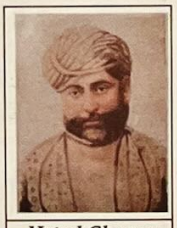
Mewati Gharana *(Haryana)*

- This Gharana is known for *Tarana* form of singing.
- Founder: *Ghagge Nazir Khan.*

Exponents

Pt. Jasraj

- He introduced *Jugalbandi* form of singing *(Padma Vibhushan in 2000).*
- *Maniram, Kala Ramnath (associated with Violin), Tripti Mukherjee, Ratan Mohan Sharma, Arvind Thatte.*



Ustad Ghagge Nazir Khan

Maihar Gharana

- Founder: *Ustad Allauddin Khan.*
- Unique feature: This Gharana is known for its blending of *Hindustani* and *Carnatic* elements, as well as its influence on *Western music.*

Exponents

Annapurna Devi

- She plays surbahar and is daughter of Allaudin Khan.
- She is the founder of *Senani Gharana.*

Ustad Allaudin Khan

- *Ravi Shankar (Sitar), Nikhil Banerjee (Sitar), Ali Akbar Khan (Sarod and is son of Allaudin Khan), Hariprasad Chaurasia (Flute), Pannalal Ghosh (Flute), VG Jog (Violin).*

Indore Gharana

- Founder: *Ustad Amir Khan.*
- Exponents: *Sultan Khan (plays Sarangi), Pt. Amarnath, Shankar Lal Mishra, Kalyan Banerjee, Purabi Mukherjee.*

Ustad Amir Khan

Jaipur Atrauli Gharana

- Founder: *Alladiya Khan* (he was from Aligarh then migrated to Jaipur).
- Exponents: *Kesarbai Kerkar, Mallikarjun Mansur, Vidyadhar Vyas, Bande Ali Khan (Rudra Veena), Pt. Lakshman Prasad, Kishori Amonkar.*

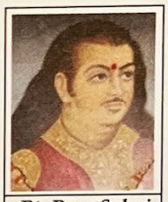
Alladiya Khan

Punjab Gharana

- Founder: *Lal Bhawani Singh.*
- Exponents: *Alla Rakha (Guru andfather of Zakir Hussain), Zakir Hussain (he received Padma Vibhushan (2023) → Both are Tabla player, Nikhil Ghosh (Tabla), Shafaat Ahmed Khan, Ustad Ashfaque Hussain, Miyan Qadir Baksh.*

Benaras Gharana of Khayal

- Founder: *Pt. Gopal Mishra.*



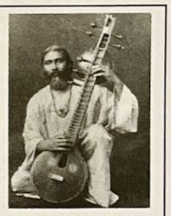
Pt. Ram Sahai

Benaras Gharana of Tabla

- Founder: *Pt. Ram Sahai.*
- Exponents: *Ustad Bismilla Khan (plays Shehnai; received Bharat Ratna in 2001), Pt. Anokhelal Mishra (Tabla), Pt. Kishan Maharaj, Samta Prasad, Pt. Kanthe Maharaj, Gopal Mishra, Hanuman Prasad Mishra.*

Rampur Sehaswan Gharana *(Uttar Pradesh)*

- Founders: *Ustad Inayat Khan* and *Mahbub Khan*
- Exponents: *Ghulam Mustafa Khan, Ustad Rashid Khan, Sadik Hussain Khan, Ustad Nisar Khan, Zeeshan Khan, Abbas Khan.*



Ustad Inayat Khan

Bhendi Bazar Gharana *(Mumbai)*

- Founder: *Ustad Chhajju Khan* (Moradabad, Uttar Pradesh)
- Exponents: *Aman Ali Khan, Lata Mangeshkar, Anjanibai Malpekar, Shashikala Koratkar.*

Agra Gharana

- This Gharana is known for its blend of *Khyal* and *Dhrupad-Dhamar* styles.
- They are descendants of *Nauhar Bani.*
- Founders: *Haji Sujan Khan*
- Exponents: *Faiyaz Khan, Malka Jaan, Latafat Hussain Khan, Dinkar Kaikini, Vijay Kichlu, Lalita Rao, Ghagge Khuda Baksh.*

Lata Mangeshkar

- **Bharat Ratna: 2001**
- **Padma Vibhushan: 1999**
- **Padma Bhushan: 1969**
- **Dada Saheb Phalke Award: 1989**

Delhi Gharana

- Founder: *Sidhar Khan Dhadi.*
- Exponent: *Tanras Khan.*

Darbhanga Gharana *(Bihar)*

- They sing *Khandar Vani* and *Gauhar Vani* forms of singing
- Founder: *Radha Krishna* and *Karta Ram.*
- Exponents: *Ram Chatur Mallick, Premkumar Mallick, Siyaram Tiwari, Vidur Mallick.*

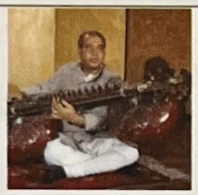
Ustad Faiyaz Khan

Dumrao Gharana

- Founder: *Pt. Ghanarang Baba.*
- Exponents: *Pt. Tilak Chand Dubey, Ramjee Mishra.*

Dagar Gharana

- This Gharana is famous for its *Dhrupad* styles.
- Exponents: *Gundecha Brothers (Padma Shri in 2012), Zia Mohiuddin Dagar (Rudra Veena)*



Zia Mohiuddin Dagar

A distinct "dhrupad style" is associated with Bishnupur Gharana.

GHARANAS OF KATHAK DANCE

Lucknow Gharana of Kathak

- Founder: *Ishwari Prasad.*
- Exponents: *Pandit Birju Maharaj, Shambhu Maharaj, Lacchu Maharaj, Kalika Prasad, Manjari Chaturvedi.*

Benaras Gharana of Kathak (Uttar Pradesh)

- Founder: *Janaki Prasad.*

Jaipur Gharana of Kathak

- Founder: *Bhanu Ji Maharaj.*
- Exponent: *Vidyagauri Adkar.*

Raigarh Gharana of Kathak

- Founder: *Raja Chakradhar Singh.*

(A) *(B)* *(C)*

(A) Pt. Birju Maharaj;
(B) Janaki Prasad;
(C) Raja Chakradhar Singh

Wanawun music is sung in wedding ceremonies in J&K.

Types of Musical Instruments of India

In Natya Shastra, *Bharat Muni* categorizes Indian musical instruments into four main types: *Avanaddha (membranophones), Ghana (idiophones), Sushira (aerophones), and Tat (chordophones).*

1. *Tantu Vadya (Chordophones)→ String Instruments*
   - Sound is produced by *plucking* or *bowing* the stretched strings. *E.g., Sitar, Sarod, Santoor, Veena, Rudra Veena, Violin, Surbahar, Guitar, Mohan Veena.*
2. *Sushir Vadya (Aerophones) → Wind Instruments*
   - Sound is produced by *blowing air* through instrument. *E.g., Flute, Shehnai, Nadaswaram.*
3. *Avanaddha Vadya (Membranophones) → Percussion Instruments*
   - Sound is produced by *striking a stretched membrane* (made of animal skin) or drumhead. *E.g., Tabla, Pakhawaj, Mridangam, Drums.*

Percussion instruments are of two types:

1. *Idiophones:* An idiophone is any musical instrument that creates sound primarily by the vibration of the instrument itself, without the use of air flow, strings, membranes or electricity. *E.g. Xylophones, bells, etc.*
2. *Membranophones:* A membranophone is an instrument which produce sound by a stretched membrane that is struck or vibrated. *E.g. Tabla, mridangam, etc.*

4. *Ghana Vadya (Idiophones)→ Solid Instruments*
   - Sound is produced by *striking or shaking* solid materials. *E.g., Ghatam, Manjira, Kartal.*

Some Traditional Instruments

- ***Kamaicha:*** A bowed flute played by *Manganiyars* of *West Rajasthan.*
- ***Kartal:*** Awooden clapper from the state of *Rajasthan* that comes under Idiophones.
- ***Chinkara:*** A stringed instrument played popularly in *Madhya Pradesh.*
- ***Pena:*** A traditional stringed instrument that is played in states of *Manipur* and *Assam.*

MUSICAL INSTRUMENTS AND EXPONENTS

STRING INSTRUMENTS *(Tantu Vadya)*

Sitar

- Sitar is a plucked string instrument used in Hindustani music.

Exponents

Pt. Ravi Shankar

- First Indian to win Grammy for the album *"West Meets East" (1968).*

- He is also the Indian to win *most no.* of Grammys *(a total of 5)*.
- He is the *second* Indian musician to receive *Bharat Ratna* (India's highest civilian award) in *1999*.
- *Anoushka Shankar, Vilayat Khan, Imrat Khan, Nikhil Banerjee, Budhaditya Mukherjee, Pt. Harashankar Bhattacharya, Arvind Parikh, Anupama Bhagwat, Rajeeva Janardhan (Imdadkhani Gharana).*

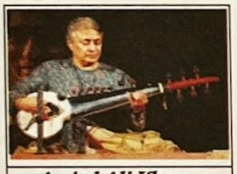
- *First Grammy won by* Mickey Hart in 1992.
- First female *to win Grammy:* Tanvi Shah
- Father of Fusion dance *(also known as "Hi"form of dance)* → Pt. Uday Shankar *(brother of Pt. Ravi Shankar)*

Sarod

- A stringed instrument known for its deep, resonant sound.

Exponents

Amjad Ali Khan


Amjad Ali Khan

- He is known as *"Sarod Samrat"*.
- He is known for *fast* and *clear ekhara taan.*
- He has received *Padma Bhushan (1991)* and *Padma Vibhushan (2001).*
- *Alauddin Khan (Maihar Gharana), Ali Akbar Khan (Maihar Gharana), Hafiz Ali Khan (Padma Vibhushan in 1998), Rajeev Taranath (disciple of Ali Akbar Khan), Buddhadev Dasgupta.*

Santoor

- It is known as *"Shattantri Veena"* in Sanskrit and has *72 strings.*

Exponents

Shivkumar Sharma

Shivkumar Sharma

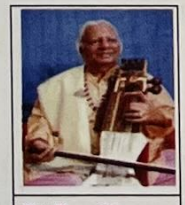
- He *popularised* Santoor.
- He has received *Sangeet Natak Akademi Award (1986)* and *Padma Vibhushan (2001).*
- *Rahul Sharma, Ulhas Bapat, Bhajan Sapori, Tarun Bhattacharya (won Sangeet Natak Akademi Award in 2018).*

Sarangi

- It is a *bowed, short-necked* instrument often used in classical and folk music.

Exponents

- *Pt. Ram Narayan (Padma Vibhushan in 2005), Ustad Sabri Khan, Bundu Khan, Binda Khan, Shakoor Khan, Abdul Latif Khan, Ustad Sultan Khan.*


Pt. Ram Narayan

Veena

Jayanthi Kumaresh

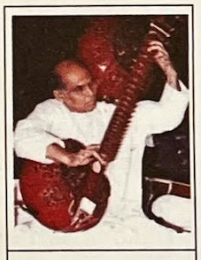
- It is an ancient, *revered stringed* instrument.
- *Samudragupta* (Gupta Dynasty) is depicted playing Veena on his *coins.*
- Mughal Emperor *Aurangzeb* and former PM *APJ Abdul Kalam* also played Veena.

Saraswati Veenais crafted from the wood of Jackfruit.

Exponents

- *S. Balachander, Jayanthi Kumaresh (plays Saraswati Veena), Chitti Babu, E. Sankara Sastry, Doraiswamy Iyengar.*

Rudraveena


Asad Ali Khan

- It is used in *Dhrupad* music.

Exponents

- *Asad Ali Khan, Zia Mohiuddin Dagar, Sadik Ali Khan.*

Surbahar

- It is a plucked string instrument also known as *bass sitar.*

Exponents

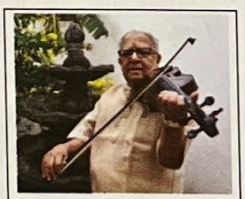
Annapurna Devi

- *Annapurna Devi, Ustad Imrat Khan (also known as Surbahar instrument master), Wahid Khan, Imdad Khan.*

Violin

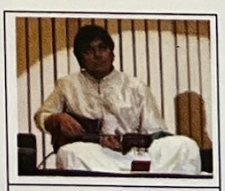
- It is a stringed instrument with *4 strings* held against the shoulder under the chin and *played with a bow.*

Exponents


T.N. Krishna

- *T.N. Krishnan (Padma Bhushan in 1992), Nagai Muralidharan, Lalgudi Gopala Iyer Jayaraman (Padma Bhushan in 2001), Mohanan Chandrasekaran (an awardee of Madras Music Academy's Kalanidhi), Dwaram Venkataswamy Naidu, V. G. Jog, N. Rajam, Ragini Shankar, Nandini Shankar, M. Gopalkrishna (Padma Bhushan in 2012), Ganesh and Kumaresh Rajagopalan, Lakshminarayana Subramaniam, Mysore Nagaraj and Mysore Manjunath (Mysore Brothers).*

Mandolin


U. Srinivas

- A mandolin is a stringed musical instrument in the lutefamily and is generally plucked with a pick.

Exponents

- *U. Srinivas, S Balamuralikrishna, Nagen Dey, Khagen Dey.*

Guitar

- It is a stringed instrument with *6 strings* that is played by *plucking* or *strumming*.

Brij Bhushan Kabra

Exponents

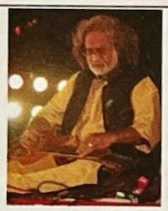
- *Brij Bhushan Kabra (won Sangeet Natak Academy in 2005), Thakur Chakrapani Singh.*

Mohan Veena

- It is a *modified Hawaiian guitar* with *20 strings*.

Exponents

Pt. Vishwa Mohan Bhatt


Pt. Vishwa Mohan Bhatt

- He won *Grammy (1994)* for album *"A Meeting by the River"*.
- He also won *Sangeet Natak Akademi Award (1998)* and *Padma Bhushan (2017).*

Ektara

- Ektara is a *single string*, musical instrument made using *bamboo* and a *gourd*, mostly used by traditional folk singers in *Maharashtra*.

WIND INSTRUMENTS *(Sushir Vadya)*

Flute *(Bansuri)*

- It is a wind instrument consisting of a tube and *6 or 7 fingerholes*.

Hariprasad Chaurasiya

Exponents

Hariprasad Chaurasiya

- He was born in Prayagraj.
- He has received *Padma Bhushan (1992)* and *Padma Vibhushan (2000).*

Prasanna surname associated with Flute.

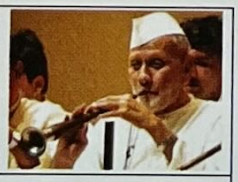
- *Pannalal Ghosh (other name: Amal Jyoti Ghosh), Rajendra Prasanna, Rajendra Kulkarni, Rakesh Chaurasiya, Prabhat Sharma.*

Shehnai

- It is an instrument made of wood that has *7 fingerholes*.
- It is also known as *Mangala Vadya* (auspicious instrument).

Exponents

Ustad Bismillah Khan


Ustad Bismillah Khan

- He was born in Dumraon, Bihar.
- He played Shehnai at *Red Fort* on *India's first Independence Day (15th August 1947).*
- He has received all the four highest civilian awards: *Bharat Ratna (2001), Padma Vibhushan (1980), Padma Bhushan (1968)* and *Padma Shri (1961).*
- The Iranian city of *Tehran* named an auditorium after him → *Tahar Mosiquee Ustaad Bismillah Khan.*
- He is also the *3rd* Indian musician to receive Bharat Ratna.
- *Raghunath Prasanna (also plays flute), S. Ballesh, Ali Ahmed, Bageswari Quamar, Krishna Chaudhary.*

Nadaswaram

- It is *similar to Shehnai but larger in size*, mostly played in South Indian temples.

Exponents

- *T.N. Rajarathinam Pillai, Rajratna Pillai, Neeru Swami Pillai, Sheikh Chinna Maulana.*

T.N. Rajarathinam Pillai

Harmonium

- A harmonium is a keyboard instrument that produces sound by blowing air through metal reeds.

Exponents

- Tulsidas Borkar

PERCUSSION INSTRUMENTS *(Avanaddha Vadya)*

Tabla

Exponents

Zakir Hussain

Zakir Hussain

- *Total Grammy received: 4*
- He has received a total of *3 Grammy* (in 2024) for: *"Pashto", "As We Speak", "This Moment"* with fusion music group *Shakti*.
- *4th* Grammy for a collaborative album *"Global Drum Project"*.
- He has received *Padma Bhushan (2002)* and *Padma Vibhushan (2023).*
- *Nikhil Ghosh (Padma Bhushan in 1990), Bickram Ghosh, Ananda Gopal Bandopadhyay (Benaras Gharana), Anokhelal Mishra, Pt. Swapan Choudhary, Ananda Gopal Bandopadhyay, Shubhankar Banerjee, Shreya Bhattacharjee.*

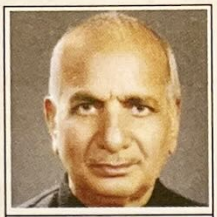
Pudukkotai Dakshinamurthi Pillai is renowned for his exceptional skills in playing the Kanjira.

Pakhawaj

- It is used in *Dhrupad* music.

Exponents

- ***Kunal Patil, Tota Ram Sharma, Pt. Bhavani Shankar, Ustad Rahman Khan, Kelucharan Mohapatra.***



Tota Ram Sharma

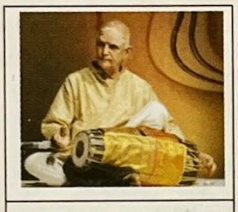
Mridangam

- A mridangam is a double-headed drum used in South Indian classical music

Exponents

Umayalpuram K. Sivaraman

- He has received *Padma Bhushan (2003), Padma Vibhushan (2010),* and *Sangeet Natak Akademi (1992).*
- ***V.K. Sivaraman, Rajna Swaminathan, Guruvayur Dorai, RV Raghavan.***



Umayalpuram K. Sivaraman

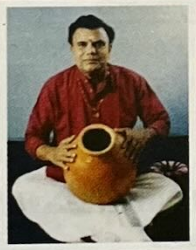
Ghatam

- It is a clay pot used as a percussion instrument.

Exponents

E. M. Subramaniyam

- He was awarded the title of *"Kalaimamani" (2000)* and has won *Sangeet Natak Akademi Award (2011).*



E. M. Subramaniyam

TH Vinaykram

- He is also known as *Vikku Vinaykram.*
- He has received *Padma Bhushan (2014).*

Drums

- Drums make sound when struck.

Exponents

- ***Sivamani***

Sivamani

Folk Music of Different States

State	Description
Andhra Pradesh	❖ **Burrakatha :** Burrakatha is a folk storytelling art from Andhra Pradesh and Telangana. It is famously performed during the Perupalem Beach Festival.
Assam	❖ **Kirtan-Ghosha :** This was composed by the prominent Assamese saint and polymath, Srimanta Sankardev.
	❖ **Assamese Lullabies :** Nichukoni Geet are traditional lullabies in Assam.
	❖ Bihu-Geet
	❖ Zikir folk music
Bihar	❖ **Biraha :** The sad plays and songs popular in 19th century Bihar's Bhojpur region.
	❖ **Mangal folk songs :** Sung in the Mithila region of Bihar.
Chhattisgarh	❖ **Pathori Geet :** Sung during Bidding farewell to a newly-wed bride.
	❖ **Dohe songs :** Sung during Diwali.
	❖ **Dewar Geet :** Sung as entertainment songs.
	❖ **Tambura :** It is an instrument commonly used as a prop during the performance of Pandavani.
Gujarat	❖ The raga "Sorathi" derives its name from the region located in Gujarat.
	❖ The raga "Bilaval", named after Veraval, is traditionally associated with Gujarat.
Goa	❖ **Mando :** The central theme of Mando music is Love and historical narratives.
	❖ It is a slow verse and refrain composition dealing with love, tragedy and both social injustice and political resistance.
Himachal Pradesh	❖ **Hulki :** A traditional drum from Himachal Pradesh.
	❖ **Narsingha :** A traditional wind instrument, characterized by its ornate curved hornpipe design and ceremonial use in the folk music of Himachal Pradesh.
Haryana	❖ Ragani folk songs
Jammu & Kashmir	❖ **Chakri :** It is a popular folk music form of Jammu and Kashmir. The intricate footwork in Rouf is also sometimes referred to as Chakri.
	❖ **Wanawun :** The vocal songs sung during the Rouf dance are called Wanawun.
	❖ **Sufiana music :** Hafiz Nagma is a dance based on the musical notes of Sufiana music.
	❖ **Lal Ded (Lalleshwari) :** She was a Kashmiri mystic of the Shaivism tradition who used poetic verses known as Vak.
Jharkhand	❖ **Jhumti Song :** It is tied to the "Jhumair" folk dance.
	❖ **Adharatiya :** A traditional folk song.

State	Description
Kerala	❖ **Sopana Sangeetham :** It is a devotional classical music tradition originating from Kerala.
	❖ "Sopana" translates to steps, and this music is traditionally performed on the steps of temples in Kerala.
	❖ Pulluvan pattu folk music, Ottanthullal songs, Kathakali music, church choir, Mappila songs, etc are some of the famous music forms of Kerala.
	❖ Drums like Timila and Maddalam are mentioned in Silappadikaram and still used today
	❖ **Kangarange :** A drum from South India, associated with the Carnatic music tradition.
Madhya Pradesh	❖ **Sanjha :** It is a melodious folk song sung by young girls in groups, predominantly associated with the Malwa region of Madhya Pradesh.
	❖ **Sant Singhaji :** Known as the "Kabir of Nimar." he composed in the Nirguni style (formless God).
Mizoram	❖ **Talhkhuang :** A musical instrument, made of curved wooden pieces and played with a wooden hammer, is used only at memorial stone ceremonies and not taken into homes.
	❖ **Darbu :** It looks somewhat like a large Damru. Because it is struck to produce sound, it is classified as a membranophone (Avanaddha Vadya).
	❖ **Bengbung :** It is a traditional musical instrument made of wood.
	❖ **Khuang :** This instrument features a stretched membrane, classifying it as a membranophone (Avanaddha Vadya).
Maharashtra	❖ **Lavani :** Lavani is a combination of traditional song and dance, which is particularly performed to the beats of Dholki, a percussion instrument.
	❖ Lavani is noted for its powerful rhythm.
	❖ Lavani has contributed substantially to the development of Marathi folk theatre.
	❖ In Maharashtra and southern Madhya Pradesh and North Karnataka, it is performed by the female performers wearing nine-yard long saris.
	❖ **Sangeet Ratnakara :** The term "Sangeet Ratnakara" literally translates to the "Ocean of Music and Dance".
	❖ It is a classical musical treatise, composed in the 13th century CE by Sharangadeva.
	❖ **Abhang Vanis :** Folk songs
	❖ **Narayanrao Rajhauns :** He established his own theater company called the Gandharva Natak Mandali and was honored with the Padma Bhushan in 1964.
	❖ The title of "Bal Gandharva" (Singer of Heaven) was conferred upon him by the prominent freedom fighter Lokmanya Bal Gangadhar Tilak.
Nagaland	❖ Neuleu songs
	❖ **Asem :** A traditional musical instrument of Nagaland, belongs to the drum.
Odisha	❖ **Daskathia :** It is a form of ballad singing.
Rajasthan	❖ Rajasthani music is generally based on Tied to nature, life, and stories.
	❖ **Pankhida songs :** Sung by peasants while working in the fields.
	❖ **Kamaicha :** This string instrument is central to the Manganiyar community's musical tradition in Rajasthan.
	❖ **Ravanhatta :** It is a traditional instrument from Rajasthan, it is specifically played by the Bhopa community.
	❖ **Lotia folk music :** Sung by women carrying water pots (Lota).
	❖ **Maand folk music :** Similar to Thumri or Ghazal.
	❖ **Bhopa :** It is a form of folk music.
Sikkim	❖ **Simikla Koom (Binayo) :** It is a musical instrument. According to mythology, it was created by the deity ' s brothers : Sawakemba, Samdang Khewa, and Lingdang Khewa.
Tamil Nadu	❖ **Swathi Thirunal :** He was the Maharaja of the Travancore kingdom (located near present-day Tamil Nadu).
	❖ He was a great patron of Hindustani and Carnatic music, as well as the Mohiniyattam dance form.
	❖ **Vamsi :** The 'Vamsi', a traditional instrument of Tamil Nadu, is a Flute.
Uttar Pradesh	❖ **Hori :** This traditional music form is sung in the Braj region of Uttar Pradesh.
	❖ **Rasiya folk songs :** In the context of 'Rasiya' folk songs of Uttar Pradesh, Bumb refers to Large drums.
	❖ **Kajri :** It is sung by women during the monsoon, often with night-long group dancing.

State	Description
Uttarakhand	❖ Chhopati folk songs
	❖ **Bhankora :** The Bhankora is an aerophone (Sushir Vadya) from the Garhwal region of Uttarakhand.
	❖ **Mangal :** Mangal is a folk tradition performed by the Jaunsari tribe of Uttarakhand.
West Bengal	❖ **Padavali Kirtans :** Sung in devotional gatherings.
	❖ **Bhawaiya folk songs :** Sung solo or in chorus.
	❖ **Dotara :** It is a traditional string instrument widely played in the Bengali tradition, covering regions like West Bengal, Assam, and Bangladesh.
	❖ Baul music
Punjab	❖ **Tappa :** It was developed by Shori Mian. It is traditionally sung during joyous occasions. It features rapid, jumpy notes inspired by camel riders' songs.
	❖ **Bhangra :** Bhangra is an energetic folk music and dance style associated with Punjab, typically performed during harvest seasons and festive occasions.
Ladakh	❖ It is known for the monastic music tradition that includes sacred chants with drumbeats called 'Yang'.
	❖ A monastic orchestra that uses the instrument 'Gyaling' (oboe) is associated with Ladakh

PAINTINGS OF INDIAN STATES

State	Paintings
Himachal Pradesh	❖ Kangra, Guler, Chamba (Pahari Styles)
Punjab	❖ Phulkari (Art on fabric), Sikh School of Art
Uttarakhand	❖ Aipan (Ritualistic floor/wall art)
Uttar Pradesh	❖ Sanjhi (Stencil art), Braj Art , Chikankari , Choke Poorna , Sona Rakhna
Haryana	❖ Phad (shared with Rajasthan), Saanjhi
Rajasthan	❖ Phad, Pichwai, Kishangarh, Miniature Paintings
Gujarat	❖ Pithora, Rogan Art, Mata ni Pachedi
Maharashtra	❖ Warli, Pinguli Chitrakathi
Goa	❖ Kaavi Art (Red oxide murals)
Madhya Pradesh	❖ Gond, Bagh Murals
Chhattisgarh	❖ Rajwar, Bhitti Chitra
Bihar	❖ Madhubani (Mithila), Manjusha, Tikuli Art
Jharkhand	❖ Paitkar, Sohrai and Khovar Art
West Bengal	❖ Kalighat, Patachitra, Patua Dokra (Art on metal/clay)
Odisha	❖ Pattachitra, Saura, Palm Leaf Etchings
Andhra Pradesh	❖ Kalamkari, Nirmal Paintings
Telangana	❖ Cheriyal Scroll Painting
Karnataka	❖ Mysore Painting, Chittara
Tamil Nadu	❖ Tanjore (Thanjavur)
Kerala	❖ Kalamezhuthu (Floor art), Mural Paintings
Sikkim	❖ Thangka (Buddhist Scrolls)
Assam	❖ Manuscript Paintings (Hasti Vidyarnava)
Arunachal Pradesh	❖ Monpa wood carvings/paintings
Manipur	❖ Khambana Kao Phaba

Indian Dance Forms

Indian dance forms can be divided into two types:

1. **Classical Dance Forms:** They have *particular steps* that need to be performed in particular events (mostly performed in temples).
2. **Folk Dance Forms:** *No particular steps* are defined. They are performed in a specific ritual.

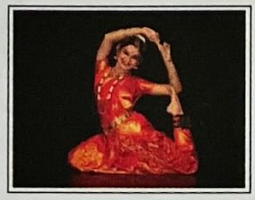
CLASSICAL DANCE FORMS

- There are *8 classical dances* according to *Sangeet Natak Academi* (HQ: New Delhi) however the *Ministry of Culture* recognises *9 classical dances (8 classical dances + Chhau).*
- *Origin:* Rooted in *Natya Shastra* (considered as *"Fifth Veda"*), written by *Bharat Muni*.
- *Abhinaya Darpana* by *Nandikeshvara* describe expressions, movements, and gestures.
- *Nritta*: Purest form of dance.
- *Nritya:* Expressive form of dance (pure dance + expression).

BHARATNATYAM *(Tamil Nadu)*

- It is the *oldest classical dance* of India that is performed solo (by a single person) → known as *Ekaharya*.
- *Earlier Names: Sadirattam, Thevarattam, Parathaiyar Attam.*
- Bharatnatyam was earlier also known as *Dasiattam* as it was traditionally performed by *Devadasis* (female dancers) in temples (last surviving devadasi: *R. Muthukannammal*).
- *Symbolises*: Fire
- It is found in Natya Shastra and is associated with *Kalakshetra style*.
- It was banned by Britishers in *1910* but was later revived.
- **Revival by:** *E. Krishna Iyer* and *Rukmini Devi Arundale* → renamed the dance Sadirattam to Bharatnatyam.

Forms of Classical Dance:



- *Shaivite (majority)*→ Dedicated to *Lord Shiva* (masculine).
- *Vaishnavite* → Dedicated to *Lord Vishnu* (feminine).
- *References in literature:* Found in *Cilappatikaram* (by *Ilango Adigal*) and *Manimegalai* (by *Chithalai Chathanar*).
- *Main mudra: Kataka Mukha Hasta*
- Bharatnatyam was performed by certain families of the *Tanjore district* and these inheritors were known as *'Nattuvanar'*.
- *Performance Style: Pandanallur, Vazhuvoor, Kalakshetra, Melattur, Tanjore*
- *Movements/Stages of Dance: Alarippu* (flowers offering), *Jatiswaram, Shabdam, Varnam, Padam, Tillana, Mangalam.*

Facts

- Tamil text *Tolkappiyam* was composed during *2nd Sangam*.
- *Lasya:* Feminine (Parvati)
- *Tandava:* Masculine (Shiva)
- Bharatnatyam is also depicted in temple *Gopuram (Chidambaram Temple)*.

TRICK TO REMEMBER EXPONENTS

भारत की अलार्म बाजी और उसने उठते ही अपनी माता रुक्मिणी देवी के पदम छुए और अपनी सुंदर दोस्त मीनाक्षी और अपने सारे भाइयों को लेकर बालकृष्ण लीला देखने चला गया और धन लाकर सो गया

भरत	→	Bharatnatyam
अलार्म	→	Alarmel Velli
रुक्मिणी देवी	→	Rukmini Devi Arundale
पदम	→	Padma Subrmanyam (leading figure in Bharatnatyam)
सुंदर दोस्त मीनाक्षी	→	Meenakshi Sundaram Pillai
सारे भाइयों	→	Mrinalini Sarabhai (also an exponent of Kathakali dance), Mallika Sarabhai (also an exponent of Kuchipudi dance).
बाल	→	Bala Saraswati
कृष्ण	→	Yamini Krishnamurthy (also an exponent of Kuchipudi dance)
लीला	→	Leela Samson
धन	→	Shanta Dhananjayan/V P Dhananjayan
सो गया	→	Sonal Mansingh (also an exponent of Odissi dance)

Alarmel Valli is associated with Pandanallur style and is also an exponent of Odissa dance.

Rukmini Devi Arundale

- She is the *first woman* to be nominated in *Rajya Sabha.*
- She is the founder of *Kalakshetra Dance School* (Estd. 1936).
- *She received:* Padma Bhushan (*1956*).

Yamini Krishnamurthi

- *"Asthana Narthaki"* (Resident Dancer) title was bestowed upon her by *Tirumala Tirupathi Devasthanam Temple.*
- *She received:* Padma Vibhushan *(2016)*, Padma Bhushan *(2001)*, Padma Shri *(1968)*, Sangeet Natak Academi Award *(1977)*.

Sonal Mansingh

- She is *youngest recipient* of Padma Vibhushan (2003).
- *Other Exponents:* Rama Vaidyanathan, Meenakshi Chittaranjan, Narthaki Nataraj, Urmila Satyanarayanan,

M K Saroja, Radha Sridhar, Deepak Mazumdar, CV Chandrashekhar.

KUCHIPUDI *(Andhra Pradesh)*

- ***Earlier known as:*** *Bhagavata Mela Dance* (Tanjore, Tamil Nadu).
- ***Modern form of dance is attributed to:*** *Tirtha Narayan-ayati and Siddhendra Yogi* (developed as a dance-drama → *Bhama Kalpam* (story of *Satyabhama*, the charming but jealous wife of Lord Krishna)}
- ***Symbolises:*** Earth
- ***Elements***: *Ganesha Vandana, Jatiswaram, Shabdam, Kalapam, Padam, Tarangam* (it is the concluding part of dance where the dancer dances on a rim of *brass plate*).
- *Yakshagana* was performed in Andhra Pradesh in earlier times. It is traditionally performed from dusk till dawn.

TRICK (1) TO REMEMBER EXPONENTS

जिसके सरनेम में भी Reddy दिख जाए वह Kuchipudi से Related होगा

- Raja Reddy, Radha Reddy, Padmaja Reddy, Bhavana Reddy, Yamini Reddy.
- ***Other Exponents:*** Yamini Krishnamurthy, Mallika Sarabhai.

TRICK (2) TO REMEMBER EXPONENTS

सत्यम और सतीश लक्ष्मी जी की सत्यनारायण कथा में गए जहाँ उन्होंने एक सुंदर लड़की शोभा के साथ कुच्ची पूड़ी खायी

सत्यम	→	Vempata Chinna Satyam
सतीश	→	Aparna Satisham
लक्ष्मी	→	Lakshmi Narayan Shastri
सत्यनारायण	→	Vendantam Satyanarayan (Padma Shri Awardee)
सुंदर	→	Swapna Sundari
शोभा	→	Shobha Naidu
कुच्ची पूड़ी	→	Kuchipudi, Halim Khan

- ***Kuchipudi was initially performed by Brahmin boys.***
- ***Sri Krishna Leela Tarangini authored by Narayan Teertha***

ODISSI *(Odisha)*

- ***Symbolises***: Water
- *Gotipua* is a traditional dance form of Odisha that was originally performed by *Maharis*, female temple dancers. Today, *young boys* perform the dance in the style of the Maharis. Gotipua is the *precursor* to the classical Odissi dance.

TRICK (1) TO REMEMBER

अगर नाम में Mohapatra और Mohanty दिख जाए तो Odissi से Related है

- *Kelucharan Mohapatra* (considered as *father of Odissi* who popularised the dance; *Padma Vibhushan* in *2000*), Sujata Mohapatra, Leela Mohanty, Niharika Mohanty.
- *"Adiguru"* of Odissi dance: Pankaj Charan Das
- ***Other Exponents:*** Kiran Sehgal, Mayadhar Raut, Indrani Rehman.
- *Protima Gauri* founded *Nrityagram* (an institution in Karnataka) dance village and popularised Odissi.

TRICK (2) TO REMEMBER EXPONENTS

भूटान के प्रधान माधवी से मिलने उडीशा आए और यह बात विजय ने संजू और साहू को बता दी

भूटान	→	Shagun Bhutani
प्रधान	→	Gangadhar Pradhan
माधवी	→	Madhavi Mudgal
उडीशा	→	Odissi
विजय	→	Bijayni Satpathy
संजू	→	Sanjukta Panigrahi
साहू	→	Sudhakar Sahu Sutapa Talukdar

- ***Elements in Odissi:*** *Mangalacharan, Batu Nritya, Pallavi, Tharijham, Moksha.*

KATHAK *(Uttar Pradesh)*

- The name is derived from *"Katha" (storytelling)*.
- It is the only classical dance to feature *Persian elements.* The *Mughals* patronised this dance.
- It is performed in *Hindustani music* and *Urdu ghazals.*
- The last Nawab of Awadh (*Wajid Ali Shah*) widely associated with the patronage of Kathak dance.
- ***Elements:*** *Amad, Thaat (standing position), Tukra, Paran, Jugalbandhi, Tarana, Bhaav, Kramalaya Ghat.*
- ***Gharanas associated with this dance:*** Lucknow Gharana (Founder: *Ishwari Prasad*), Jaipur Gharana (Founder: *Bhanuji Maharaj*), Banaras Gharana (Founder: *Janaki Prasad*).

TRICK TO REMEMBER EXPONENTS

अरे महाराज नारायण और देवी में आस्था रखो उनका प्रसाद खाओ विदया मिलेगी लखपति बनोगे और सब मंगल होगा

महाराज	→	Birju Maharaj, Lacchu Maharaj, Acchan Maharaj
नारायण	→	Shovna Narayan
देवी	→	Sitara Devi
आस्था	→	Kamini Asthana, Nalini Asthana
प्रसाद	→	Narayan Prasad, Kalka Prasad, Ishwari Prasad
विद्या	→	Vidhya Gauri Adkar

लखपति → Kumudini Lakhia
मंगल → Aditi Mangal Das, Kumkum Dhar, Roshan Kumari

Birju Maharaj

- He is from *Kalka Bindadin Gharana (Lucknow)*.
- He founded the dance school *Kalashram* in *Delhi* in *1998*.
- *Received*: Padma Vibhushan (*1986*)
- *Other Exponents:* Gopi Krishan, Rani Kasna, Geetanjali Lal, Maulik Shah.

MOHINIYATTAM *(Kerala)*

- This dance form is associated with Hindu God *Vishnu* (his female avatar *"Mohini"*).
- This dance is also called *"Dance of Enchanters"* (graceful dance).
- *Symbolises*: Air
- References of this dance is mentioned in *"Vyavaharamala"* (ancient text) written by *Mazhamangalam Narayanan Namputiri*.
- This dance form has *no abrupt jerks* but has smooth performance.
- This classical dance is known to have *24 hand gestures*.
- *Elements: Cholkettu, Jatiswaram, Padavarnam, Padam, Tillana, Slokam, Saptam.*
- *Dance Forms: Tevitichiyattam, Nangai Natakam, Dasiyattam.*

TRICK TO REMEMBER EXPONENTS

मोहिनी गोपी के कान में सुना जय राधा कृष्णा की अम्मा

मोहिनी → Mohiniyattam
गोपी → Gopika Verma
कान → Kanak Rele
सुना → Sunanda Nair
जय → Jayaprabha Menon
राधा → Radha Dutta
कृष्णा → Pallavi Krishnan
अम्मा → Kalyanikutty Amma

Kalyanikutty Amma

- She played a major role in revival of this dance form.
- Received: Sangeet Natak Akademi Award *(1974)*.
- She is the founder of *Kerala Kalyanam (Estd. 1952).*

V N Menon

- He helped to repeal the *ban on temple dancing* in Kerala thereby reviving the Mohiniyattam.
- *King Swathi Thirunnal* not only revived Mohiniyattam, but was also responsible for inculcating *Carnatic classical music* into the dance form.

KATHAKALI *(Kerala)*

- Katha means *"Story"* and Kali means *"Performance"*.
- This dance form is performed by a *male performer*. This dance is usually performed in temples after *Sevakali* session.

> • *Kalaripayattu is a martial dance.*

- The vocal performance of this dance is in *Sanskritised Malayalam*.
- It is based on epics of *Ramayana* and *Mahabharata*.
- There is a use of *facial expressions* and *face colour* (face is *painted in green* → the colour represents *strength*). Hence considered as *"Mask Dance"*.
- Colors and their meanings: Green (*strength*) and Red (*evil*).
- Vesham (5), Expression (9), Hand gesture (24).
- *Forms*: *Natyam, Nritham, Nrithyam, Sangeetam, Vadya*.
- *Elements*: *Kelikottu, Thodayam, Purappadu, Tiranokku, Ilakiyattam, Kalasam.*
- *Aharya* means *costume* and *makeup* in Sanskrit.

There are five major Veshams (makeup)

- *Pacha*: Green, for noble, heroic, and generous characters
- *Kathi*: Knife, for villainous characters
- *Thadi*: Beard, for characters with beards
- *Kari*: Black, for evil characters
- *Minukku*: Radiant, for noble, virtuous female characters

TRICK TO REMEMBER EXPONENTS

बाल मिले ना मिले कुछ गोपी की कली मिल जाए

बाल → P. V. Balkrishna
मिले → Milena Salvini
कुछ → Kunchu Kurup
गोपी → Gopi Nath
कली → Kottakal Nandakumaran Nair Mrinalini Sarabai

MANIPURI *(Manipur)*

- It is an introverted type of dance form which is based on *Vaishnavism* (a Vaishnavite form of dance).
- Ashtapadis of *Jayadeva's Gita Govinda* are sung in Manipuri.

Forms of Manipuri Dance:

1. **Raas Leela**
- It depicts the love story of *Krishna* and *Radha*.
- *Propounder*: *Rajarshi Bhagya Chandra*
2. **Sankirtana Tradition**
- *Jagoi* and *Cholom* are two parts of this tradition.
- Cholom is *masculine aspect* of the dance form in which *pung* (drum) is used to perform the dances.
3. **Thang-Ta**
- It is a *martial dance*

TRICK TO REMEMBER EXPONENTS

- ***Surname with Devi is mostly associated with Manipuri dance:*** Kalavati Devi, Gambhini Devi, Bimbavati Devi
- *Exponents*: Jhaveri sisters, Nirmala Mehta, Guru Bipin Singh (He received the title *"Hanjaba"* from some Manipur King), Charu Mathur, Devyani Chalia, Aluna Kabuini.
- *Other Exponents:* Rajkumar Singhajit Singh, Nileshwar Mukherjee.

SATTRIYA *(Assam)*

- It is a *Vaishnavite* form of dance that was included under classical dance category in the year *2000*.
- The theme of dance form is related to *Lord Krishna*.
- *Founder of Sattriya Dance: Srimanta Sankaradeva*
- Ankiya Naat is a *"one-act play"* written in *Brajavali*. In Assam, it is called as *"Bhaona"* a traditional art form that combines *dance, music,* and *visual art*.
- *Dance numbers: Chali* (no theatre components), *Jhumura, Nadu Bhangi.*
- *Exponents*: Jatin Goswami, Bhupen Hazarika (Bharat Ratna in 2019), Guru Ghanakanta Bora, Indira Bora, Maniram Dutta, Krishnakshi Kashyap, Meenakshi Medhi, Sharodi Saikia.

VARIOUS ORGANISATIONS

1. *Sangeet Natak Akademi/Indian National School of Dance:* Delhi.
2. *Kalakshetra School of Dance:* Rukmini Devi Arundale (mother of Modern Bharatnatyam).
3. *National Institute of Kathak:* 1964 (New Delhi).
4. *Nehru Manipur Dance Academy:* 1954 (Imphal).
5. *Govindji Nrityalaya:* Manipur.
6. *Darpana Academy of Performing Arts* established by Mrinalini Sarabhai and Vikram Sarabhai: 1949 (Ahmedabad).
7. *Nalanda Nritya Kala Mahavidyalaya:* Mumbai.
8. *National Institute of Performing Arts:* Mumbai.
9. *Kalasharam Kathak School established by Birju Maharaj:* New Delhi.
10. *Kadam School of Dance and Music founded by Kumudini Lakhia:* 1967 (Ahmedabad).

ANDHRA PRADESH

TRICK TO REMEMBER: *Veer Logon* Ke Liye *Dhimese Koyle Ki Bhaap* Se *Burra Banalu*

TRICK	Dance	Description
Veer	*Veeranatyam*	❖ Known as the "Song of Bravery" or Dance of warriors. ❖ Performed by the Veeramusti community (believed to be followers of Veerabhadra (Lord Shiva)).
Logon	*Lambadi*	❖ Banjara tribe
Dhimese	*Dhimsa*	❖ Tribe of Araku valley. ❖ Performed by 15-20 women forming a chain.
Koyle	*Kolattam*	❖ It is a stick dance performed in many southern states, including Andhra Pradesh, Tamil Nadu and Karnataka. ❖ It is not restricted to one specific state. ❖ It is mainly performed during the pongal festival.
Bhaap	*Bhamakalapam*	❖ Dance-drama, Composed by Siddhendra Yogi.
Burra	*Burrakatha*	❖ Tambura instrument is used in the performance of Burrakatha.
Banalu	*Bonalu*	❖ Celebrated in honour of Goddess Mahakali.
	Butta Bommalu	❖ Mask dance ❖ Performed in West Godavari region. ❖ Butta Bommalu means "Basket Toys".
	Dappu Nrityam	❖ Performed in Andhra Pradesh and Telangana by the Mala and Madiga communities playing the Dappu (dafli) drum.
	Kolannalu	❖ Stick dance of Andhra Pradesh.
	Vilasini Natyam	❖ Traditionally performed by devadasis in temples and courts. ❖ It was revived from near extinction by swapnasundari.
	Gusadi	❖ Performed by the gond tribe.
	Dandaria	❖ Performed by the gond tribe.
	Yakshagana	❖ Mainly from karnataka, but also performed in AP.

Dhimsa dance

Butta Bommalu Dance

ARUNACHAL PRADESH

TRICK TO REMEMBER: *Rekha → Aruna Aji Wancho Baua Ke Pas Chalo Sham Ko Aur Mask Lagake Lion and Peacock Dance Dekho*

TRICK	Dance	Description
Rekha	*Rikhampada*	❖ Nyishi tribe
Aji	*Aji Lamu*	❖ Monpa tribe
Wancho	*Wancho*	❖ War dance ❖ The Wancho tribe celebrated in March/April during the Oriah festival. ❖ It is also known as the unity dance because it showcases the unity of their community.
Baua Ke	*Buiya*	❖ Digaru Mishmi tribe
Pas	*Pasi Kongki*	❖ The Adi tribe performs this on Abhang songs.
Chalo	*Chalo Loku*	❖ Nocte tribe performs in Oct-Nov.
Sham Ko	*Bardo Chham*	❖ Dance of 12 zodiacs (Sherdukpen community) and is associated with Tibetan-Buddhist.
Mask	*Mask*	
Lion and Peacock	*Lion and Peacock*	❖ Monpa tribe
	Popir	❖ Performed by Garo tribe in tribute to Mopin Ape (Goddess of prosperity and fertility).
	Ponung	❖ Adi tribe
	Yak Chham	❖ Mask dance It is also known as Yak dance.
	Tapu	❖ Performed by the Adi tribe during the solung festival.
	Ojiyele	❖ Performed by the Galo tribe during the Mopin festival.
	Ozele	❖ Wancho tribe

Lion and Peacock Dance

Rikhampada Dance

ASSAM

TRICK TO REMEMBER: *Ali Bhor Main Deo Ke Pass Gaya, Hey Bhagawan Maths Main Ank Dila Dena Iss Pali Main Jhum Ke Nachunga*

TRICK	Dance	Description
Ali	*Ali ai Ligang*	❖ The Mishing tribe performs Gumrag dance in this festival (observed on first Wednesday of Feb-March).
Bhor	*Bhortal*	❖ Developed by Narhari Burha Bhakat and is performed by Satriya community in Barpeta.
Deo	*Deodhani*	❖ Performed to pay tribute to Goddess Mansa (Snake Goddess).
Ank	*Ankiya Naat*	❖ One -Act play ❖ It is centred around acts of Lord Krishna and teachings of Vaishnavite faith.
Pali	*Ojapali*	❖ Semi-dramatic tradition folk dance.
Jhum	*Jhumur*	❖ Performed by Kulis (people who work in tea gardens).
	Bagarumba	❖ Performed by Bodo tribe during Bwisaga festival (women wear Dokhona/Arunai). ❖ A butterfly dance performed by the women of the Bodo tribe in Assam during their New Year festival. ❖ Known as the "Bodo tribe's Bihu" and signifies nature (butterflies, birds). ❖ In January 2026, over 10,000 participants performed this to create a Guinness world Record at the Arjun Bhogeswar Barua Stadium (Sarusajai Stadium) in Guwahati.
	Bihu	❖ It is a dance and also a festival. ❖ A Group of dancers performing in circles or rows, often accompanied by drums / pipes to celebrate the Bihu festival. ❖ Women wear a traditional costume called "Mekhela Chador". Three types of Bihu: ❖ Bohag Bihu /Rongali Bihu: celebrated as a New year festival in Spring (March-April). ❖ Kati Bihu / kongali Bihu: performed in October (kartik mo nth). ❖ Magh Bihu /Bhogali Bihu: performed in January (Magh mo nth).
	Baidima	❖ Dimasa tribe
	Bawang	❖ Karbi Anglong tribe
	Yak Chaam	❖ Monpa tribe.
	Rabha War Dance	❖ Dhawa dance ❖ A high-energy warrior dance performed by the Rabha community in the regions of Assam and West Bengal.

Bihu Dance

Ojapali Dance

BIHAR

TRICK TO REMEMBER: *Do Natwe Jat-Jatin Apna Sohar Khila Rahe Hai Jhum Ke*

TRICK	Dance	Description
Natwe	*Natwa*	❖ Chamar community
Jat Jatin	*Jat-Jatin*	❖ Shows tragic love story of Jat and Jatin. ❖ It is performed in Mithila region during moonlit nights (monsoon).
Sohar Khila	*Sohar Khelwana*	❖ Performed during child birth.
Jhum Ke	*Jhumri*	❖ Performed in Mithilanchal region during Karthik month (Oct-Nov).

TRICK	Dance	Description
	Bidesia	❖ A Bhojpuri folk dance created by Bhikhari Thakur, who is famously known as the "Shakespeare of Bihar". ❖ This dance deals with many social issues, contradictory topics and conflict between the traditional and the modern, the urban and the rural, and the rich and the poor. ❖ Its main theme is to end discrimination.
	Jharni	❖ Juhula community
	Jhijhiya	❖ From the mithilanchal region, performed mainly by women during navratri for Goddess Durga (dancers carry a pot on their heads).
	Kajari	❖ Performed to welcome the arrival of the monsoon season.
	Karma	❖ Baiga tribe ❖ It is an agrarian ritual performed during bhadra Ekadashi. performed during the Karma festival. ❖ Also done in jharkhand , odisha and chhattisgarh.
	Launda Naach	❖ Male performers cross-dressing as women, showcasing regional traditions and entertaining audiences during festivals.
	Pari khanda	❖ Martial dance
	Paika	❖ Also done in Jharkhand and odisha. ❖ Performance segments of Piaka Nritya: ❖ Blowing the war conch (shankha). ❖ Shild- sword sparring drills. ❖ Acrobatic somersaults. ❖ Group victory shout of "Jai Jagabbath".
	Dhibia	❖ Dhangar community
	Domkach	❖ Performed by Women of the groom's family.

Jhijhiya Dance

Bidesia Dance

CHHATTISGARH

TRICK TO REMEMBER: *Aksar Suwa Karma Na Karke Gendiya Marte Hai Pagalpanti Karte Hai Aur Pandavo Ke Saath Jhumur Ke Niche Saila Dance Karte Hai.*

TRICK	Dance	Description
Aksar	*Kaksar*	❖ Performed by the Abujh Maria tribe of Bastar region.
Suwa	*Suwa Nacha*	❖ Kamar tribe ❖ Suwa literally translates to parrot. ❖ Dancers perform by mimicking the movements of a parrot.
Karma	*Karma Nacha*	❖ Performed during Karma festival around sacred karma tree. ❖ The ritual honours the Karam tree on Bhadra Ekadashi in Chhattisgarh. ❖ The drum most associated is the Madal. Also done in Jharkhand, Odisha and Bihar.
Gendiya	*Gendi*	❖ Baiga tribe ❖ A dance that involves balancing and dancing on bamboo sticks (stilts).
Marte Hai	*Gaur Maria*	❖ Performed by the Bison Horn Maria community during occasions like births and marriages.
Pa-galpanti	*Panthi Nacha*	❖ Performed by Satnami community (followers of Satnam panth). ❖ Panthi dancers wear Dhoti during performance. ❖ The dance encodes the teachings of Guru Ghasidas from his compilation called "Amritvani".
Pandavo	*Panda-vani*	❖ A style of folk singing which includes narration of tales from Mahabharata. ❖ It is the dark horse of Chhattisgarh Folk dance. ❖ It portrays the account of pandavas - the main account of pandavas-the main characters of an epic battle. ❖ Famous exponents : Teejan Bai (Padma Vibhushan in 2019) and Usha Barle (Padma Shri in 2023).
Jhumur	*Jhumair*	❖ Linked with the Karam Puja or Sohrai festival.
Saila Dance	*Saila*	❖ Performed by boys of Bhil tribe during harvest season. ❖ It is also known as a stick dance. ❖ Performed by the Gond tribe. ❖ It is a post-harvest dance performed in the month of Aghan (Nov-Dec). ❖ It is also performed in Odisha and Madhya Pradesh.

TRICK	Dance	Description
	Baiga Pardhoni	❖ An energetic dance from Chhattisgarh and Madhya Pradesh. ❖ Performed by the Baiga tribe during marriages to welcome the groom's procession (Barat). ❖ Baiga tribes also perform karma, saila, and Faag.
	Bison Horn Maria	❖ Performed by the Maria / Dandami Maria tribe (A Gond sub-group) in the Bastar region of Chhattisgarh and parts of Jharkhand. ❖ Dancers mimic the movement of a wild bison, with men wearing horn headgear, while women generally wear ornaments made of brass or silver. ❖ Ghotul : A traditional center of the Dandami Maria tribe used for imparting education and as a meeting place for unmarried couples.
	Raut Nacha	❖ Performed by the Yadav community, mainly at night.

Suwa Nacha

Pandavani Dance

GUJARAT

TRICK TO REMEMBER: *Gujarat Ki Gopiyan Dandiya aur Garba Khelne Siddiyon Se Matak Ke Padhar Rahi Hai*

TRICK	Dance	Description
Gopiyan	*Gop Raas*	
Dandiya	*Dandiya Raas*	❖ It depicts the fight between Durga Mata and Mahishasura. Performed during Navratri after Aarti. ❖ The Sticks used in the dance represent the sword of Goddess Durga. ❖ It represents a mock fight between Goddess Durga and the demon Mahishasura, symbolizing the victory of good over evil.
Garba	*Garba*	❖ Graceful dance performed during Navratri before aarti.
Siddiyon Se	*Siddi Dhamal*	❖ Performed by Siddhi community of African origin.
Matak	*Matukadi*	❖ Ravari and Bharwad community.
Padhar	*Padhar*	❖ Padhar community, Mainly performed in the Nal Sarovar region of Ahmedabad.
	Tippani	❖ Koli and Kharwa tribe. ❖ Performed with sticks in Chorwad district. ❖ Tippani arises from the Saurashtra region of Gujarat. ❖ Women forcefully tap the floor with wooden sticks / rods to showcase and mimic hard labor. ❖ Male drummers provide dhol-nagara accompaniment.
	Hudo	❖ Bharwad tribe (shepherd community).
	Ashwa	❖ Koli community
	Shikaar	❖ It showcases hunting traditions. Mainly performed in the Dharampur region of Gujarat.
	Manjira	❖ Padhar community, Mainly performed in the Nal Sarovar region of Ahmedabad.
	Dangi	❖ Performed by Dangi Adivasis of Dang district.
	Daang	❖ Performed primarily in the dang district. ❖ Musical instruments such as drums and flutes are used to accompany the dance.
	Titodo	❖ Performed by unmarried people.
	Kakada	❖ Performed to please the goddess for protection against pox.
	Rathwa	❖ Rathwa tribe
	Bhavai	❖ The long wind instrument Bhungal is associated with the Bhavai.
	Lasya	❖ It later became Garba.
	Vinchhudo	❖ It is based on the theme of a woman being bitten by a scorpion.

Garba Dance

Tippani

GOA

TRICK TO REMEMBER: *Mandvi Ghode Gadi Jaguar Dekhne Aur Patang Udane Goa Ja Rahi Hai. Chalo Gaon Romat So Jao Jake*

TRICK	Dance	Description
Mandvi	Mando	❖ This dance depicts love and romance.
Ghode	Ghode Modni	❖ This dance depicts bravery and victory and honours Maratha warriors.
Gadi	Talgadi, Fugdi	❖ Performed during Ganesh Chaturthi.
Jaguar	Jagor	❖ This dance starts at midnight and continues till early morning.
Dekhne	Dekhni	❖ Performed by Christian girls wearing Indian attire in a music that is a blend of Indian melody and Western rhythm. ❖ Traditionally performed by young women known as devadasis, who carry oil lamps (diyas) during the performance.
Patang	Tarangmel	❖ Performed during Holi and Dussehra festivals.
Goa		❖ Goa
Chalo	Dhalo	❖ Performed by women standing in two parallel rows interlocking their arms.
Gaon	Gonf	❖ Performed during festivals after the harvest.
Romat	Romat	❖ This dance is associated with Shigmo festival in the month of Phalgun (Feb-March).
So Jao	Sao Jao	❖ Performed during Sao Jao festivals in the month of June.
	Goff	❖ Performed during Shigmo festival.
	Kunbi	❖ Dance of the earliest settlers/tribals of Goa.
	Dhangar	❖ Performed by the shepherd community of Goa.

Ghodemodni Dance

Gonf Dance

HIMACHAL PRADESH

TRICK	Dance	Description
Nata	Nati	❖ Performed in Shimla, kullu and sirmaur regions. ❖ The dance holds Guinness World Record for the most number of dancers (9,892 dancers) participating in Kullu district.
Chhora	Jhora/Jhali	
Aman	Dhaman	❖ Performed during Dussehra in Kullu region.
Him Pe		❖ Himachal Pradesh
Rakshasho	Rakshas Nritya	❖ Performed wearing a demon mask.
Chola	Cholamba	❖ Oldest dance performed after killing a tiger.
Mala	Kayang Mala	❖ Performed by boys and girls who form a garland-like pattern by interlocking their arms.
Sandh	Shand / Shabu	❖ Performed mainly in Buddhist monasteries and Lahaul. ❖ Performed to honor Lord Buddha.
Dang	Dangi	❖ A popular traditional folk dance of the Chamba region.
Chapa	Chapeli	❖ Performed in Sirmaur and Chamba districts.
Chap	Cham	❖ Performed by Buddhist monks to ward off evil spirits.
	Rasa	❖ Performed in Sirmaur district.
	Gaddi Nati	❖ Mainly performed in the three regions Chamba valley (Bharmour region), kangra and kullu.
	Chhatrari	❖ Performed by the Gaddi tribe in the Chamba valley.
	Thoda	❖ Performed by Rajputs community in the sirmaur region. ❖ It showcases the battle between the kauravas and pandavas from the Mahabharata.
	Chham Chhanak	❖ Performed by lamas of Lahaul-Spiti as a tribute to Lord Buddha.
	Jhanjhar	❖ Gaddi communities
	Chohara	❖ Performed in Mahasu region.

TRICK TO REMEMBER: *Nata Chhora Aman Him Pe Rakshasho Ka Chola Aur Mala Odh Ke Sandh Per Baithkar Dang Lekar Chapa Chap Kar Raha Hai*

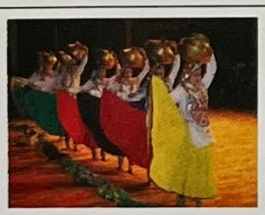
Nati Dance

Rakshasa Dance

HARYANA

TRICK TO REMEMBER: *Haryana Ki Choriya Daphli aur Manjira Leke Jhumar Ke Niche Dhamaal Macha Rahe Phalgun Main*

TRICK	Dance	Description
Choriya	Khoria	❖ This dance is a variety of Jhumar dance styles.
Daphli	Daph	❖ Performed in spring season to commemorate bountiful harvest.
Manjira	Manjira	❖ Performed in Mewat district.
Jhumar	Jhumar	❖ Performed by young married girls.
Dhamal	Dhamal	❖ Performed by men of Ahir community outside in moonlight (in Phalgun). ❖ The origin is rooted back to Mahabharata.
Phalgun	Phag	❖ Performed in Phalgun during Holi.
	Loor	❖ Performed by girls of Bangar region in Phalgun during Holi.
	swang (Saang)	❖ A popular folk theatre dance.
	Gugga	❖ Performed by men in loving memory of Saint Gugga.
	Ghoomar	❖ Ghoomar is famous in Rajasthan but is also performed in Haryana.



Jhumar Dance

Khoria Dance

JAMMU & KASHMIR

TRICK TO REMEMBER: *Harris Rouf Bhand Hoke Dhul Main Kud Raha Hai Manali*

TRICK	Dance	Description
Harris Rouf	Rouf	❖ Performed by women standing in rows during the Spring season and major festivals like Eid / Ramadan. ❖ It is famous for its intricate footwork.
Bhand	Bhand Pather	❖ It is a dance-drama.
Dhul	Dumhal	❖ Performed by men of Wattal tribe, started by Sufi saint Shah Sukar Saloni. ❖ Exclusively Wattal men plant a banner before dancing. ❖ Dumhal dancers wear colorful robes during the performance.
Kud	Kud	❖ Performed at night to honour Lok Devta.
Hai	Hikat	❖ Performed in spring in harvest season. ❖ Participants join hands and spin while singing.
Manali	Damali	

Rouf Dance

Bhand Pather Dance

JHARKHAND

Dance	Description
Karam/ Karma	❖ Performed by Oraon tribe where they worship Kadam tree during the festival (autumnal festival). ❖ Performed during karma festival. ❖ Also done in Odisha , Chhattisgarh and Bihar.
Paika	❖ It is a traditional martial art dance performed by the Munda tribe or Sadan community. ❖ Also done in Bihar and Odisha.
Mundari	❖ A traditional tribal dance of the Munda community performed during harvest festivals.
Domkach	❖ It is a Nagpuri folk dance. ❖ It is a folk song form of Jharkhand that reflects the lived experiences, social unity, and often accompanies dance and drama performances.
Jhumair / Jhumar	❖ It is a folk dance performed by the Sadan community. ❖ It is a harvest dance of jharkhand, performed in linked rows with mandar and nagara drums.
Chhau	❖ It is a martial art dance. ❖ Three types: Purulia Chhau (West Bengal), Seraikella (Jharkhand), and Mayurbhanj Chhau (Odisha).
Santhali	❖ This dance is also known as Jhika Dasain and is performed in October month by Santhal tribe.

Dance	Description
Hunta	❖ An ancient tribal dance performed by Santhal tribe which is a form of preparation for hunting.
TUSU	❖ Performed by the Kurmi community in the Chhota Nagpur Plateau.
Bison Horn Maria	
Phagua	❖ Performed during Holi.

Domkach Dance

Mundari Dance

KARNATAKA

TRICK TO REMEMBER: *Yash Bola Kam Kar Saale Doll Bhootha Nagamandali Veerta Khatam Karegi*

TRICK	Dance	Description
Yash	*Yakshagana*	❖ Performed in colourful dresses in coastal regions. ❖ Yakshagana means "song of the celestial beings". ❖ Combines dance, music, dialogue, costume, and stage techniques with a unique style.
Bola	*Bolak*	
Kam	*Kamsale*	❖ Performed by devotees of God Mahadeshwara. ❖ Kamsale is a brass instrument.
Kar	*Karga*	
Doll	*Dollu Kunitha*	❖ Known as drum- dance. ❖ Performed by the Kuruba community. ❖ Dollu means "drum" in Kannada.
Bhootha	*Bhootha Aradhne*	❖ A ritualistic dance performed in coastal regions to celebrate connection between human, nature and divine spirit.
Nagman-dali	*Nagaman-dala*	❖ Performed by two priests, one enacts male snake and other as female snake.
Veerta	*Veeragase*	❖ Performed by Virabhadra community during Dussehra. "Veer " means warrior, making it a vigorous warrior dance. ❖ Performed by the Veerashaiva (Lingayat) community.
Veerta	*Veeragase*	❖ They are devotees of Lord Shiva and wear a Shivalinga around their necks. ❖ The dance is performed to honor Lord Veerabhadra (an avatar of Lord Shiva).
	kolattam	❖ It is a stick dance performed in many southern states, including Andhra Pradesh, Kerala and Tamil Nadu. ❖ It is mainly performed during the pongal festival.
	Kodava	❖ Warrior dance of the Coorg district in Karnataka.
	Karagam	❖ It is also known as karakattam. ❖ It is performed to honor the Rain Goddess Mariamman to seek good rainfall.
	Hulivesha	❖ Tiger dance
	Somana Kunitha	❖ Performed by the Gangemata or Okkaliga communities.
	Goravara Kunitha	
	Joodu Haligi	❖ A "rhythmic performance involving two circular drums."
	Gaarudi Gombe	❖ Giant puppets carried by dancers.
	Bolak-Aat	❖ Performed during the Kailpodh (weapon worship) or Huttari (harvest) festivals.

Yakshagana Dance

Dollu Kunitha Dance

KERALA

Dance	Description
Ottamthullal	❖ A dance-drama was introduced by Kunchan Nambiar.
Kaliyattam / Theyyam	❖ Depicts religious rituals of sacred groves of Malabar coast. ❖ Known as the "dance of Gods" with intense performances, heavy makeup, and elaborate costumes. ❖ Performed by the Vannam and Malayan communities in the North Malabar region (Kannur and Kasaragod districts). ❖ Vibrant costumes represent divine gods. ❖ Traditionally held from November to April during the kaliyattam festival.

Dance	Description
Koodiyattam	❖ This dance is a traditional Sanskrit theatre art dance.
Kolakali	❖ Stick dance. ❖ In this dance, the dancers move in a circle striking small sticks in rhythm with their steps.
Chakyar Koothu	❖ A monologue performance where the performer narrates episodes from Hindu epics (such as Ramayana and Mahabharata).
Oppana	❖ Performed by the Muslim (Mapplia) community of the Malabar region in Kerala during marriages. ❖ Two types of Oppana: ❖ Oppana Chayal (no clapping) and Oppana Murukkam (continuous rhythmic clapping).
Mayil Attam	❖ Also known as the "Peacock Dance". ❖ Dancers wear peacock feathers to honor Lord Murugan (Kartikeya).
Villu Pattu	❖ Known as the "Bow Song Dance" because a large bow (arrow and bow style) is used during the performance.
Kummi	❖ Performed by women in circles.
Kakkarissi Natakam	❖ It is a folk theater/dance form primarily focusing on satirical elements.
kolattam	❖ Stick dance. ❖ Also performed in Andhra Pradesh and Tamil Nadu.
Puli Kali	❖ It is performed during Onam, depicting Tiger Hunting.
Thiruvathira kali	❖ It is a group dance performed mainly by women. ❖ Women wear white sarees called "kasavu saree". ❖ They dance in circles around a central lamp (deep). ❖ It is performed during the Thiruvathira festival (Dhanu month) and Onam. ❖ It commemorates the day Lord Shiva accepted Goddess Parvati as his wife.
Thappu kali	
Kooravara kali	Performed during local temple festivals (Utsavams).
Kalaripayattu	❖ Martial dance
Velakali	❖ Martial dance
Theeyattu	❖ Solo dance - drama

Ottamthullal Dance

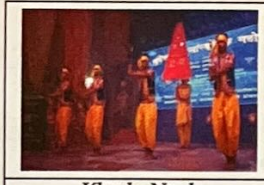
Kaliyattam Dance

MADHYA PRADESH

TRICK TO REMEMBER: *Aksar Goriya Ada Dikhane Ke Liye Matki Main Jawara Aur Phulpati Rakhke Manch Pe Khada Nachti Hai Aur Tali Bajati Hai*

TRICK	Dance	Description
Aksar	*Kaksar*	❖ Abujhmaria or Muria tribe of Madhya Pradesh and Chhattisgarh.
Goriya	*Bhagoria*	❖ Bhil tribe of Jhabua district.
Ada	*Aada*	❖ The dance is a variation of matki dance performed in Malwa region.
Matki	*Matki*	❖ Performed in Malwa region.
Jawara	*Jawara*	❖ Harvest dance
Phulpati	*Phulpati*	❖ Performed by unmarried girls of Malwa region.
Manch	*Maach*	❖ Performed in Malwa region.
Khada Nachti	*Khada Nach*	❖ Performed in Malwa region.
Tali	*Tertali*	❖ Kamar tribe
	Saila	❖ Baiga tribe and Gond tribe. ❖ Performed during Dussehra. ❖ It is also known as a stick dance. ❖ It is a post-harvest dance performed in the month of Aghan (Nov-Dec). ❖ Also performed in Odisha and Chhattisgarh. ❖ In MP, it is mainly performed in Betul, Chhindwara and Sarguja districts.
	Baiga Pardhoni	❖ An energetic dance from Madhya Pradesh and Chhattisgarh. ❖ Performed by the Baiga tribe during marriages to welcome the groom's procession (Baraat).
	Badhi dance	❖ It is a celebratory dance ("Badhai" means greeting / congratulations). ❖ Performed during childbirth and marriages. ❖ It is primarily performed to thank Goddess Sheetala.
	Rai	❖ Performed in the Bundelkhand region of Madhya Pradesh. ❖ The women who traditionally perform this dance are known as "Bedni". ❖ Men also perform this dance in disguise (cross-dressing as women). ❖ A highly famous exponent of this dance was Ram Sahay Pandey, who was awarded the Padma Shri in 2022.
	Kathi	❖ Performed in the Nimar region of Madhya Pradesh to worship Lord Shiva and Goddess Parvati.

TRICK	Dance	Description
	Naurata	❖ Performed during Navratri in Bundelkhand region.
	Mal-lakhamb	❖ Martial dance
	Ahirai	❖ Bharaia tribe



Khada Nach

Tertali

MANIPUR

Dance	Description
Thang-Ta	❖ Meitei community ❖ Manipuri martial art dance. ❖ This dance involves the use of swords, spears, and shields.
Lai Haraoba	❖ Meitei tribe
Dhol Cholom	❖ An energetic drum dance performed by men during "yaashang" (Manipuri Holi). ❖ It starts slowly and gradually becomes highly energetic.
Pung Cholom	❖ This dance is also known as Mridanga kirtan or Dhumal.
Jagoi	❖ This dance is also known as Manipuri Raas-leela.
Khamba Thoibi	❖ Meitei tribe
Pheiphit Lam	❖ Meitei tribe
Nupa	❖ Performers wearing White Turbans.

Thang-Ta Dance

Pung Cholom Dance

MEGHALAYA

Dance	Description
Nongkrem	❖ Khasi tribe
Wangala	❖ Performed by Garo tribe during Wangala festival (also known as "Festival of Hundred Drums").
Behdeinkhalam	❖ Jaintia tribe
Laho	❖ Jaintia tribe and Pnar tribe.
Shad Suk Mynsiem	❖ It is a thanks giving dance of the Khasi tribe. ❖ It is also known as the "Dance of joyful Hearts".
Shad Pliang	Jaintia tribe

Wangala Dance

Nongkrem Dance

MIZORAM

TRICK TO REMEMBER: *Mizoram Ke Manch Pe Khullam Chillam Zang Chal Rahi*

TRICK	Dance	Description
Khullam	*Khullam*	❖ It is also known as "Dance of Guests".
Chillam	*Chailam*	❖ Performed during Chapchar Kut festival.
Zang	*Zangtalam*	❖ Paite tribe
Chal	*Cheraw*	❖ This dance is also known as Bamboo dance. ❖ Performed mainly during the Chapchar Kut festival. ❖ Men hold and clap bamboo staves on the ground while dancers step in sync between them.
	So Lakia / Sarlamkai	❖ Pawi and Mara communities. ❖ Performed to celebrate victory in war.
	Tlanglam	❖ Performed during Chapchar Kut festival.
	Chheih Lam	It is known as a dance of "joy and exhilaration".
	Chawng Laizawn	Pawi (Lai) tribe

Cheraw Dance

Zangtalam Dance

MAHARASHTRA

TRICK TO REMEMBER: *Eh Kohli Vadapav Lana, Lazy Kahin Ki Tamasha Kar Rahi Hai, Dafa Hoja Varna Mouni Jo Dhangka Natak Karti Hai Uske Paas Chala Jaunga*

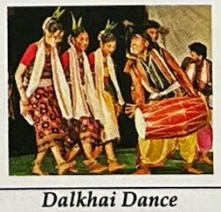
TRICK	Dance	Description
Kohli	Koli	❖ Performed by the fisherman community.
Vadapav	Povadas	❖ The dance describes events in the life of Chhatrapati Shivaji Maharaj.
Lana	Lavani	❖ A combination of traditional song and dance performed to the beats of Dholki. ❖ Baithakichi Lavani: Lavani performed for a private audience. ❖ Sulochana Chavan is known as Lavani Samradhni (Lavani Queen).
Lazy	Lezim	❖ An acrobatic dance that involves calisthenic moves.
Tamasha	Tamasha	❖ It is derived from Sanskrit dramas "Prahasana" and "Bhana". ❖ It is a Marathi folk-theatre genre often staged in villages during Shigma (Holika). ❖ The Kolhati community is traditionally linked with Tamasha troupes.
Dafa	Gafa	❖ Performed by Gond tribe in Vidharbha region.
Mouni	Mouni	❖ Thakur tribe
Dhangka	Dhangari	❖ Performed by shepherds, cowherds and blanket weavers of Sholapur district (known as Dhangars).
Natak	Natak	
	Mardani Khel	❖ Martial dance
	Dindi	❖ It is associated with the Marathwada region. ❖ Performed in the month of Kartik.

ODISHA

TRICK TO REMEMBER: *Pua Khaya Dalkhai Danda Leke Ghum Raha Bhaga Nacha*

TRICK	Dance	Description
Pua Khaya	Gotipua	❖ Performed by young boys dressed as women to praise Lord Jagannath and Lord Krishna.
Dalkhai	Dalkhai	❖ Performed in Sambalpur region. ❖ The dance rhythmic movements showcase the love stories of Radha and Krishna.
Danda Leke	Danda Nacha	❖ Performed in Kalahandi district.
Ghum	Ghumura	❖ Tiger Dance ❖ Performed in Kalahandi district.
Bhaga Nacha	Bhaga Nacha	❖ Tiger Dance ❖ Performed in Ganjam district.
	Chhau	❖ Martial dance ❖ Mayurbhanj Chhau
	Karma	❖ Also done in Jharkhand, Chhattisgarh and Bihar.
	Ranappa	❖ Martial dance ❖ Performed in Ganjam district. ❖ The dance is dedicated to Lord Krishna. ❖ Dancers stand and perform on bamboo sticks (which are called "Ranappa"). ❖ It is influenced by the Paika martial tradition.
	Saila	❖ Gond tribe ❖ It is also known as a stick dance. ❖ It is a post-harvest dance performed in the month of Aghan (Nov-Dec). ❖ Also done in Chhattisgarh and Madhya Pradesh.
	Sambalpuri	❖ Performed in western Odisha. ❖ It is a highly energetic dance performed during the Nuakhai festival. ❖ Dancers wear ghungroos on their feet.
	Paika	❖ Performed by Khandayat warrior caste of Odisha. ❖ Also done in Jharkhand and Bihar.
	Chaiti Ghoda	❖ Kaibartas (Fishermen) community
	Jhumair	

Gotipua Dance



Dalkhai Dance

NAGALAND

TRICK TO REMEMBER: *Nagaland Ke Log Bamboo Main Naag, Aloo, Butterfly Gai Dalke Kha Rahe*

TRICK	Dance	Description
Bamboo	Bamboo	❖ Kuki tribe
Naag	Rengma	❖ Warrior Dance ❖ Performed during Hornbill festival (1-10 Dec).
Aloo	Aaluyattu	❖ Konyak tribe
Butterfly	Butterfly	❖ Zeliang tribe
Gai	Changai	❖ Changai tribe
	Zeliang	❖ Zeliang tribe
	Modse	❖ Ao tribe
	Rukhyo Sharu	❖ Lotha tribe
	Maku Ngichi	❖ Sangtam tribe
	Sekrenyi	❖ Angami tribe
	Monyu	❖ Phom Naga tribe
	Monyoasho	❖ Performed by the Phom Naga tribe during the month of April.
	Kullu Tsen	❖ A headhunting dance performed by the Yimkhiung tribe.
	Chang Lo	❖ It is also known as "Sua Lua". ❖ Performed to celebrate victory over an enemy in Nagaland. ❖ Performed by the Chang tribe during the Mohi festival.
	Leshalaptu	❖ Pochury tribe
	khupielilie	❖ Pochury tribe
	Kuki	❖ Bamboo Dance

Bamboo Dance

Rengma Dance

RAJASTHAN

TRICK TO REMEMBER: *Raja Ganga Kal Ghoom Rahe The Chaar Thali Leke Susaini Ke Saath Lekin Khayalon Main*

TRICK	Dance	Description
Ganga	Gangaur	❖ Performed to worship Mata Gauri (Lord Shiva's wife).
Kal	Kalbeliya	❖ Sapera Dance ❖ Kalbeliya tribe (known as snake charmers). ❖ The female costumes feature black, swirling skirts that are richly adorned with mirror embroidery. ❖ Kalbelia performers rarely document their art due to its oral nomadic heritage. ❖ It was added to the UNESCO list in 2010. ❖ Famous exponent: Gulabo Sapera
Ghoom Rahe	Ghoomar	❖ Ghoomar means Twirl in Rajasthan. ❖ Initially, it was performed by the Bhil tribe to worship Goddess Saraswati. ❖ Later it was adopted by the Rajput community and is performed by women. ❖ It is primarily performed during the Teej and Gangaur festivals.
Chaar	Chari	❖ Performed by women of Gujjar community.
Thali	Terah Taali	❖ Performed by the Kamar tribe in Marwar region. ❖ Dedicated to honoring the local deity Baba Ramdev.
Susaini	Suisini	❖ It involves "needle-like" hand movements.
Khayalon	Khayal	❖ Bhawai tribe.
	Ghudla	
	Kachhi Ghodi	❖ Performers wear a dummy horse around their waist.
	Bam dance	

Ghoomar Dance

Terah Tali Dance

SIKKIM

TRICK TO REMEMBER: *Chandni Sikkim Ki Zameen Pe Singh Ke Saath Ghante Bhar Se Yatra Kar Rahi Hai*

TRICK	Dance	Description
Chandni	Chu-Faat	❖ Performed by the Lepcha tribe in Pang Lhabsol festival to honour Mount khangchendzonga, the state's guardian deity.
Sikkim Ki	Sikmari	❖ A harvest dance Performed by the Lepcha tribe to celebrate the beauty of nature.
Zameen	Zo-Mal-Lok	❖ Yak Dance ❖ Lepcha tribe
Singh	Singhi Chham	❖ Kanchendzonga Dance ❖ It is also known as the Snow Lion dance. ❖ It is a sacred mask dance. ❖ Performed by the Bhutia tribe during the Pang Lhabsol festival. ❖ Performed during the Losar festival (Tibetan New year).
Ke Saath	Kagyed	❖ Involves burning an effigy of evil.
Ghante	Ghantu	❖ Gurung tribe
Yatra	Yakcham	❖ Performed in honour of the yak during Losar festival.
	Maruni	❖ Magar community Performed in Nepal , Sikkim, and Darjeeling (West Bengal). ❖ It celebrates the Tihar festival (Diwali) and was originally performed to worship Lord Vishnu.

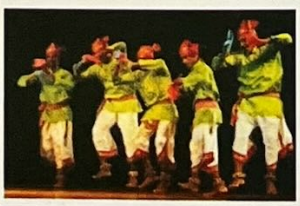
Chu Faat Dance

Zo-Mal-Lok Dance

TAMIL NADU

Dance	Description
Kolattam	❖ Stick dance ❖ Women use sticks to create rhythmic beats and perform intricate movements. ❖ It is mainly performed during the pongal festival. ❖ Performed in many southern states, including Andhra Pradesh, Kerala and Karnataka.
Silambattam/ Silambam	❖ Martial art dance.
Oyilattam	❖ Performed in the Madurai region.
Devarattam	❖ This dance is also known as "Dance of Gods".
Kudirai Attam	❖ Poikkal Kuthirai Attam Dance ❖ Dancers wear a dummy horse structure while performing.
Kummi	❖ Performed by women during Pongal festival (harvest festival). ❖ Performed by women dancing in a circle while clapping their hands to a rhythm.
Kavadi Attam	❖ Burden Dance ❖ Performed to worship Lord Murugan, devotees carry a bamboo structure (Kavadi) on their shoulders. ❖ Devotees often pierce their skin with a spear (Lord Murugan's symbol) and carry offerings of rice and milk to the temple.
Mayil Attam	❖ Also known as the "Peacock Dance". ❖ Dancers wear peacock feathers to honour Lord Murugan (Kartikeya).
Karakattam	❖ It is also known as Karagam. ❖ Performed in front of an image of the Goddess Mariamman. ❖ Goddess Mariamman is known as the Goddess of Rain.
Villu pattu	❖ Known as the "Bow Song Dance" because a large bow (arrow and bow style) is used during the performance.
Sevai Attam	❖ "Sevai" means service. ❖ It is a service/dance performed to honour God Thirumal (an avatar of Lord Vishnu) by the Nayakar community.
Bommalat-tam	❖ Puppet dance ❖ Depicts scenes from the Ramayana and Mahabharata.
Natyanjali	❖ "Natya" means dance, and "Anjali" means offering. ❖ It is celebrated primarily on Maha Shivaratri in Chidambaram, Tamil Nadu. ❖ Dedicated to Lord Nataraja, the Cosmic dancer.

Kolattam Dance



Devarattam Dance

TELANGANA

TRICK TO REMEMBER: *Dhime Se Gadi Gusa Lun Madhuri*

TRICK	Dance	Description
Dhimsa Se	*Dhimsa*	❖ Performed by women of the Porja tribe in Andhra Pradesh and Telangana.
Gadi	*Lambadi*	❖ Lambadi tribe
Gusa Lun	*Gussadi*	❖ Performed by Raj Gond tribe during Dandari festival (Dussehra/Diwali).
	Mathuri	❖ Performed in Adilabad district.
	Bonalu	❖ Performed during Bonalu festival to honour Goddess Mahakali.
	Perini Shivatan-davam	❖ It is also known as the "Dance of Warriors". ❖ It originated during the Kakatiya dynasty. ❖ Dedicated to Lord Shiva. ❖ It was revived in modern times by Dr. Nataraja Ramkrishna.
	Dappu	❖ Performed in Andhra Pradesh and Telangana by the Mala and Madiga communities playing the Dappu(dafli) drum.

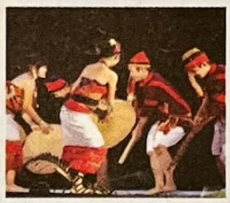
TRIPURA

TRICK TO REMEMBER: *Biju Dadagiri Mata Pe Haq Hai Sang Ghar Le Jaunga*

TRICK	Dance	Description
Biju	*Bijhu*	❖ Chakma tribe
Dadagiri	*Hojagiri*	❖ Performed by the Bru Reang community during the Hojagiri festival after durga or Lakshmi Puja. ❖ The dance appeases Goddess Maliuma and Goddess Lakshmi and marks the harvest season. ❖ Dancers move only their lower body while balancing an earthen pot on their head.
Haq Hai	*Hai Hak*	❖ Performed by the Halam/Maslum community to honour Goddess Lakshmi after harvest.
Mata Pe	*Mamita*	❖ A harvest dance performed by the Kaloi community.
Ghar	*Garia*	❖ Performed during harvest festival (Spring season).
Le Jaunga	*Lebang Boomani*	❖ "Lebang" means insect. ❖ Known as the Bamboo Dance of Tripura. ❖ It is performed during the sowing season to ward off insects from the fields. ❖ A harvest dance that depicts how bamboo clappers catch insects.

TRICK	Dance	Description
	Cheraw	❖ Lusai community
	Sangrai	❖ Performed by Mog tribe in sangria festival during Chaitra month (Bengali calendar year).
	Mosak Sulmani	❖ Mosak sumani

Hojagiri Dance

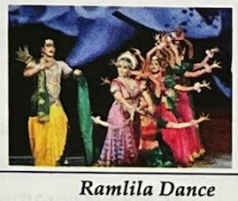


Bijhu Dance

UTTAR PRADESH

Dance	Description
Charkula	❖ Performed in the Braj region to celebrate the birth of Radha or depict the Govardhan Leela. ❖ Women carry 108 oil lamps (deep) on their heads.
Raslila	❖ Performed in the Braj region. ❖ Depicts the love stories of Lord Krishna and Radha.
Nautanki	❖ A popular folk theatre form that combines music, dance, dialogue, and narration.
Kajri	❖ Performed during the rainy season in the Bhojpuri region of UP and Bihar.
Ramlila	❖ A dramatic folk dance that re-enacts the life of Lord Rama.
Dadra	❖ A semi-classical romantic dance form that originated in the Mirzapur district performed by both men and women.
Swang(Saang)	❖ While primarily from Haryana, it is also marked for Uttar Pradesh when Haryana isn't an option, as border districts like Saharanpur perform it.

Raslila Dance

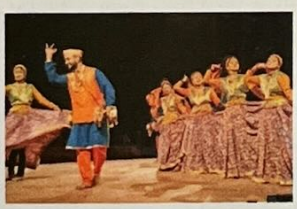


Ramlila Dance

UTTARAKHAND

TRICK TO REMEMBER: *Ashish Chanchlani Chora Hai Jhola Leke Dandi Rakh Chapa Chap Kar Raha Hai*

TRICK	Dance	Description
Chanchlani	Chanchari	❖ Performed in the Kumaon and Garhwal regions. ❖ It is danced in kumaon by mixed circles of men and women during spring fairs. ❖ The dance is accompanied primarily by the Hurka drum. ❖ In Jhora dance, participants hold each other by Arms or Waist.
Chora	Jhora	❖ Performed in the Kumaon region.
Jhola	Chholia	❖ A sword dance depicting martial traditions of the Kumaoni tribe.
Dandi	Tandi	❖ Performed by men in half circles.
Chapa Chap	Chhapeli	❖ Performed in the Kumaon region.
	Thadiya	❖ Mainly Performed during marriage in the Garhwal region. ❖ The dancers form semi-circle arcs by holding each other's shoulders.
	Pandava	❖ Performed during Dussehra and Diwali in the Garhwal and Kumaon regions. ❖ The dance narrates stories from the Mahabharata.
	Jhoda	❖ Performed on a full moon night around Holi in Kumaon region.
	Chamfuli	❖ Performed by men and women in pairs.
	Langvir	❖ It is performed to the beats of Dhol and Damau.



Chhapeli Dance

Thadiya Dance

WEST BENGAL

Dance	Description
Rabha war	❖ Dhawa Dance ❖ A high-energy warrior dance performed by the Rabha community in the regions of West Bengal and West Bengal.
Maruni	❖ Magar community ❖ Performed in Darjeeling (West Bengal), Nepal and Sikkim. ❖ It celebrates the Tihar festival (Diwali) and was originally performed to worship Lord Vishnu.
Sangria	❖ Performed by the Mog tribe during the Sangria festival in the month of Chaitra (Bengali calendar).
Purulia Chhau	❖ Masked dance from West Bengal, known for martial movements.
Jhumur	❖ Performed in tea gardens.
Gambhira	❖ A dance involving "social satire" and "dialogue with God.
Tusu	❖ Performed specifically by young, unmarried girls.
Bhadu	❖ Performed in Bhadra / Early Autumn month.
Ranpa	
Raibenshe	
Brita	
Baul	❖ Included in UNESCO's Intangible Cultural Heritage list.
Dammi	

Gambhira Dance

Purulia Chhau Dance

PUNJAB

Dance	Description
Giddha	❖ Giddha is performed by women in circles during Teej and Lohri festivals while singing "Boliyan".
Bhangra	❖ Bhangra is a lively folk dance of Punjab. ❖ Punjab is credited as the origin of Bhangra, traditionally performed to celebrate harvest and festive occasions.
Gatka	❖ Martial dance
Jaago	❖ "Jaago"means "wake up". ❖ It is a wake-up call dance performed during weddings. ❖ Women carry decorated brass vessels with lamps on their heads.
Luddi	❖ It is popular specifically in the Sandalbar region of Punjab.

LADAKH

Dance	Description
Koshan	❖ Performed in Leh and preceded by a horse race.

Dance	Description
Shondol	❖ A royal dance of ladakh, traditionally performed by highly skilled female dancers known as "Takshoma".
Jabro	❖ A high energy dance performed by the Changpa community of the Changthang plateau during the losar festival (Tibetan New Year).
Cham	❖ A sacred mask dances. ❖ performed by monks at Hemis represent various Guardian divinities of the Drukpa (Drugpa) lineage. ❖ Hemis is a famous monastery in Ladakh.
Spao	❖ A warrior dance dedicated to Gyalpo Kesar. ❖ Performed by the Changpa tribe of the Changthang plateau.

LAKSHADWEEP

Dance	Description
Parichakali	❖ Also known as Shield dance. ❖ It is a martial / warrior-style dance.
Lava	❖ Performed in the Minicoy island of Lakshadweep. ❖ Performed only by males.
Bandiya	❖ Performed in the Minicoy island of Lakshadweep.
Kolkali	❖ A stick dance performed by the Muslim community (also famous in Kerala).

SIMILAR SOUNDING DANCES

❖ ***Ghoomar / Jhumar:*** Haryanaa
❖ ***Ghoomar:*** Rajasthan
❖ ***Jhumur:*** Assam and west Bengal
❖ ***Jhumair:*** Odisha & Chhattisgarh
❖ ***Jhumar:*** Jharkhand

❖ ***Dhamal:*** Gujarat & Haryana
❖ ***Dumhal:*** Jammu & Kashmir

❖ ***Tartali:*** Madhya pradesh
❖ ***Terah Taali:*** Rajasthan

❖ ***Purulia Chhau:*** West Bengal
❖ ***Seraikela chhau:*** Jharkhand
❖ ***Mayurbhanj chhau:*** Odisha

Haka Culture : A vigorous dance performed by the Samoa tribe near New Zealand to intimidate enemies and lower their morale.

MARTIAL ART DANCES

Martial Art Dance	State/Region
Lathi	❖ Punjab / West Bengal
Purulia Chhau	❖ West Bengal
Seraikella chhau, Paika	❖ Jharkhand
Mayurbhanj Chhau , Ranappa	❖ Odisha
Gatka	❖ Punjab
Silambam	❖ Tamil Nadu
Sarit Sarak / Thang-Ta	❖ Manipur
Kalaripayattu , Velakali	❖ Kerala
Thoda	❖ Himachal Pradesh
Inbuan	❖ Mizoram
Mardani Khel	❖ Maharashtra
Pari Khanda	❖ Bihar
Mallakhamba	❖ Madhya Pradesh
Mushti Yudha	❖ Varanasi

ANDHRA PRADESH

Festival	Description
Ugadi	❖ Telugu New Year. ❖ Signifies the start of the harvest season. ❖ Marks the beginning of a new Hindu Lunisolar calendar.
Tirupati Brahmotsavam	❖ Annual festival of Lord Venkateswara at Tirumala, celebrated for 9 days.
Durgamma	❖ Celebrated in Durga Pooja.
Visakha Utsav	❖ Held in December.
Yellama Jatara	❖ Dedicated to Goddess Yellamma.
Sankranti	❖ Also known as Pedda Panduga. ❖ A harvest festival is celebrated in Andhra Pradesh and Telangana for four days with the Bhogi bonfire.
Bathukamma	❖ It is a 9-day floral festival celebrated mainly by women. ❖ A large central arrangement of flowers (called Bathukamma) is made. ❖ It starts on Mahalaya Amavasya (New Moon day). ❖ Goddess Gauri and nature are worshipped during this festival. ❖ It takes place during September-October. ❖ Celebrated in Telangana and parts of Andhra Pradesh.
Bonalu	❖ Celebrated in Andhra Pradesh and Telangana with special prayers to Goddess Kali and involves local fairs.
Perupalem Beach Festival	❖ This festival is celebrated in the West Godavari district of Andhra Pradesh, specifically at a place called Mogalthur. ❖ It was inaugurated in the year 2020. ❖ It is primarily a tourism and cultural festival that lasts for about 2 days. ❖ Events like beach volleyball are showcased during this festival. ❖ The traditional 'Burrakatha ' dance is also performed here.
Kanuma	❖ It marks the celebration of the victory of good over evil.

Bonalu

Tirupati Brahmotsavam

ARUNACHAL PRADESH

TRICK TO REMEMBER: *Arun kya tere Sang Solun* is *Tree ke neeche Chalo Sir Meri Pin pakdo aur Paas aao*

Trick	Festival	Description
Arun		❖ Arunachal Pradesh
Sang	*Sangken*	❖ A 3-day festival celebrated in April. ❖ Water festival of the Singpho tribe.
Solun	*Solung*	❖ A 10-day harvest festival celebrated by the Adi Tribe. ❖ **Apong:** This is the traditional rice beer shared during the festival to promote social bonding. ❖ **Ponung Dance:** This specific traditional dance is performed during the Solung festival. ❖ **Deities Worshipped:** They pray to the Goddess of Crop (Kine Nane) and the God of Domestic Animals (Dadi Bote) for prosperity.
Tree	*Dree*	❖ A harvest festival celebrated by the Apatani tribe in the month of July.
Chalo	*Chalo Loku*	❖ It is celebrated in the Tirap district of Arunachal Pradesh by the Nocte tribe in July/August. ❖ The word 'Lofe ' (from which Loku is derived) means "to drive out" (driving out the old season). ❖ It is a 3-day harvest festival celebrated around Oct-Nov at the end of the paddy harvest. ❖ **Day 1 (Famlam):** "Famlam" involves omen-reading by elders to determine jhum plots before the buffalo slaughter begins. ❖ This is the day when the ceremonial animal slaughter (pigs, buffaloes) actually takes place. ❖ **Day 2 (Chamkatja):** People visit monasteries or shrines ('Chaatam ') to offer prayers. ❖ **Day 3 (Thanglangja):** This is the farewell day involving communal dancing, fasting, and omen-reading.
Lo Sir	*Losar*	❖ New Year Festival of Tibetan Buddhism, celebrated by the Monpa tribe. ❖ It marks the 1st day of the Tibetan calendar.
Meri Pin	*Mopin*	❖ Celebrated by the Galo tribe in April. ❖ Popir Dance is performed during the Mopin festival.
Paas aao	*Pangsau*	❖ To honour the war heroes who died in WW2.
	Ziro	❖ Founded in 2012. ❖ It is celebrated in the Ziro Valley.

Trick	Festival	Description
	Boori-Boot	❖ celebrated by the Nyishi tribe in Spring/ Feb.
	Myoko	❖ It is celebrated by the Apatani tribe in the Ziro Valley. ❖ This festival is based on rotating village responsibility for rituals.
	Nyokum / Nyokum yullo	❖ Celebrated by the Nyishi tribe in Feb. ❖ It refers to the ritual invocation (prayer) of deities for harmony and prosperity, where Nyo means earth , Kum means Collectiveness and Yullo means invocation. ❖ It is an agricultural festival where Donyi-Polo (the Moon/Sun God) is worshipped for a bountiful harvest.
	Pongtu	❖ Celebrated by the Tutsa tribe. ❖ It is primarily observed to seek blessings from the Rangkhothak deity before millet harvesting. ❖ "Pongtu " translates to " retreating wind". ❖ It is a pre-harvest festival and is also celebrated as a New Year festival.

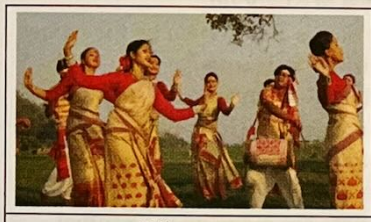
Losar

Solung

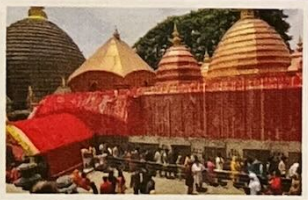
ASSAM

TRICK TO REMEMBER: *Assam ki Bahu ne Bai ko Patak patak ke mara kyunki usko Ali ke Abbu ke saath Majuli Festival dekhne jana tha.*

Trick	Festival	Description
Bahu	*Bihu*	❖ Celebrated thrice a year: ❖ Rongali/ Bohag Bihu(April): Assam New Year ❖ Kati/Kongali Bihu (Oct-Nov) ❖ Bhogali/Magh Bihu (Jan) ❖ Uruka before Magh Bihu features bonfires and feasting. ❖ Manuh Bihu includes gifting Gamucha and traditional dishes.
Baiko	*Baikho*	❖ Pre-harvest festival celebrated by the Rabha Community in June, featuring the 'Baranakai' fire.
	Baishagu	❖ The New Year festival of the Bodo Kachari community is celebrated in Mid-April, where prayers are offered to 'Bathou' / Lord Shiva.
Patak	*Dehing Patkai*	❖ A 3-day annual festival held in January at Lekhapani in Tinsukia district.
Ali	*Ali Ai Ligang*	❖ Harvest festival of the Mishing Tribe. ❖ Seed sowing festival in Feb-March by the Mising tribe, featuring the 'Gumrag' dance.
Abbu	*Ambubachi Mela*	❖ Held at Kamakhya temple. ❖ Marks the Menstrual phase of Goddess Kamakhya. ❖ Also known as Ameti/Tantric fertility festival. ❖ It occurs around mid-June and signifies the onset of the monsoon. ❖ The word 'Ambubachi' means " spoken with water ". ❖ It symbolizes Mother Earth regaining her fertility (rejuvenating for agriculture). ❖ For 3 days, the land is left completely empty - no digging, plowing, or sowing is allowed.
Majuli	*Majuli*	❖ A 3-day festival held in November.
	Rongker	❖ Celebrated by the Karbi tribe.
	Junbeel Mela	❖ Exchange of products through Barter exchange.
	Makar Sankranti	❖ Known as Magh Bihu or Bhogali Bihu.
	Bushu	❖ Dimasa community



Bihu



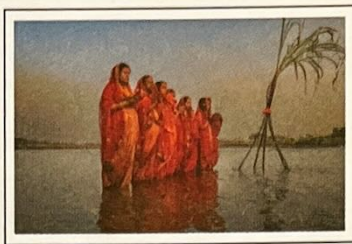
Ambubachi Mela

BIHAR

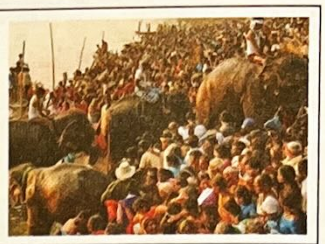
TRICK TO REMEMBER: *Sonu Shaam ko Chhath par Bahu La*

Trick	Festival	Description
Sonu	*Sonepur Cattle Fair*	❖ The largest fair for elephant trading in Asia is actually the Sonepur Mela, which is held in November in Patna, Bihar.
Shaam	*Sama Chakeva*	❖ Originates from the Mithila region.

Trick	Festival	Description
Chhath	Chhath Pooja	❖ It is a major festival of Bihar and UP dedicated to "Chhathi Maiya" and the Sun God (Surya). ❖ It begins exactly on the 6th day after Diwali. ❖ It is a 4-day long festival celebrated during Kartik month (around Oct / Nov).
Bahu La	Bihula	❖ Celebrated in August, devotees pray to the Serpent Goddess Mansa.
	Rajgir	❖ A 3 day festival started in 1986.
	Salhesh	❖ It is celebrated in the Mithila region of Bihar. ❖ This festival honors Baba Salhesh, who belonged to the Dusadh Dalit community. ❖ The Dusadh Dalit community is the primary group that celebrates this. ❖ The 'Bhagat' and 'Manarias ' narrate the dramatic stories and legends of Baba Salhesh.
	Makar Sankranti	❖ Known as Khichdi.
	Santhal Festivals (Erok Sim & Magh Sim)	❖ The Santhal community is mainly found in the states of Jharkhand, Bihar, Odisha, and West Bengal. ❖ Erok Sim marks the 'beginning' of the agricultural season. ❖ It is a seed-sowing festival celebrated before the sowing of paddy crops, very similar to the Chapchar Kut festival of Mizoram. ❖ Erok Sim is also known by the names 'Harisim' or 'Harpod'. ❖ Magh Sim is celebrated to express gratitude for the harvest and to prepare for a new agricultural cycle. ❖ During these festivals, animal sacrifices are made by the Santhal community, which generally consist of a rooster / chicken. ❖ The sacrifice is performed by the village priest, who is known as the 'Naike' (or Naiki). ❖ The sacrifice is offered at a sacred grove (a sacred piece of land/forest) known as the 'Jaherthan'. ❖ The deities to whom these sacrifices are offered are named 'Jaher Era'and 'Marang Buru'.



Chhath Pooja



Sonepur Cattle Fair

CHHATTISGARH

TRICK TO REMEMBER: *36 Madai Soncha aur Bola Haveli me Basta leke Dussehra Manaenge.*

Trick	Festival	Description
36		Chhattisgarh
Madai	Madai (Phagun Madai)	❖ It is celebrated on the eve of Holi in the Dantewada district of Chhattisgarh. ❖ It is celebrated by the Gond and Baiga tribes during February-March (the month of Phagun). ❖ It takes place at the Maa Danteshwari temple and is also referred to as the "Kumbh Mela of Tribal Culture".
Soncha	Goncha	❖ The Chariot festival is celebrated in Bastar (Jagdalpur), Chhattisgarh, primarily by the Maria and Muria tribe for 9 days. ❖ It marks the beginning of the famous Bastar Dussehra (which lasts for 75 days). ❖ Tupki is a playful mock gun made of wood/bamboo that uses Goncha fruits as bullets. ❖ A chariot procession takes place during the months of June-July, a tradition started by the Chalukya rulers. ❖ Rath Yatra begins on Ashadh Shukla Dashmi and ends on Dutiya.
Bola	Pola	❖ A thanks giving festival to acknowledge the importance of Bulls & Oxen. ❖ It is celebrated in Madhya Pradesh (Balaghat), Maharashtra, and Chhattisgarh. ❖ It takes place during the month of Shravan (monsoon) on an Amavasya (New Moon) night. ❖ After completing the heavy field work (plowing/sowing), farmers bathe and decorate their bulls with oil, turmeric, and paints to honor their hard work.
Haveli	Hareli	❖ A Harvest festival of Shravan month (July/August) celebrated by farmers.

Trick	Festival	Description
Basta Dussehra	Bastar Dussehra	❖ To honour Goddess Danteshwari.
	Karam	❖ A harvest festival tribute to Karam Tree.
	Champaran Mela	❖ An annual fair held in Champaran region, Raipur.
	Narayanpur Mela	❖ Muria tribe

GOA

TRICK TO REMEMBER: *3 Kings went to Goa's St. Francis Xavier church took some Grapes lekin Car Nahi mili aur Sunburn ho Gaya.*

Trick	Festival	Description
3 Kings	3 Kings Festival	❖ Also known as the Epiphany festival.
St. Francis Xavier	Feast of Saint Francis Xavier	❖ Celebrated on 3rd December (Death anniversary of Saint Francis). ❖ It takes place at the Basilica of Bom Jesus (associated with St. Francis Xavier).
Grapes	Grapes Escapade	❖ Wine festival
Car Nahi	Carnival	❖ Celebrated immediately before the Lent Christian period.
Sunburn	Sunburn	❖ Asia's largest Electronic Dance Music festival.
	Shigmo	❖ Shigmotsav/ Shishirotsava is a spring festival celebrated in Falgun month of the Hindu calendar. ❖ Shigmo is celebrated in the spring season for 14 days to welcome homecoming warriors. ❖ The Ghode Modni (warrior dance) and Fugdi dance (performed to the beat of drums) are performed during this festival.
	Bonderam	❖ Celebrated on the 4th Saturday of every August in the Divar Island.
	Chikal Kalo	❖ A mud festival that celebrates Lord Krishna's childhood, in the Devaki Krishna temple of Marcel, Goa.
	Sao Jao	❖ Saint John the Baptist festival.
	Maleyachi Jatra	

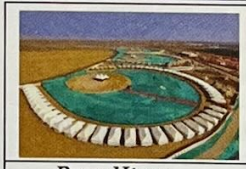
Shigmo

Carnival

GUJARAT

TRICK TO REMEMBER: *Sharma Ji Madhav se Karva Chauth pe Rann kar rahe the.*

Trick	Festival	Description
Sharmaji	Shamlaji Melo	❖ Dedicated to Lord Vishnu. ❖ Celebrated for 3 weeks in November.
Madhav	Madhavpur Mela	❖ Celebrates the marriage of Lord Krishna and Rukmini in the Porbandar district of Gujarat.
Madhav	Modhera Dance Festival	❖ Celebrated at Modhera Sun temple (Mehsana district) for 3 days in the 3rd week of January.
Chauth	Vautha Mela	❖ An animal trading festival.
Rann	Rann Utsav	❖ Also known as the "White Desert Festival" , it continues for 3 months in the Great Rann of Kutch.
	Dang Darbar	❖ A tribal festival celebrated just before Holi.
	Chitra Vichitra Fair	❖ Gharasia/Bhil tribe
	Bhavnath Fair	❖ Dedicated to Lord Shiva.
	Dhrang Fair	❖ Dedicated to Mekaran Dada (a famous saint of Kutch).
	Makar Sankranti	❖ **Uttarayan** (famous for the International Kite Festival).
	Saptak Music Festival	❖ It is celebrated in Ahmedabad, Gujarat. ❖ It lasts for 13 days. ❖ Indian classical music is showcased in this festival.



Rann Utsav

Dang Darbar

HIMACHAL PRADESH

TRICK TO REMEMBER: *Him Pari ko Haldi aur Phul se Saza do Kalinjar ke Raja aa rahe hain*

Trick	Festival	Description
Him		Himachal Pradesh
Pari	Pori	❖ Also known as the Horse Festival.
Haldi	Halda	❖ It is celebrated in the Lahaul Valley. ❖ It takes place around the time of Magh Purnima (Jan-feb). ❖ It is a 2-day New Year festival celebration for the locals in this region.

Trick	Festival	Description
Phul	Phulaich	❖ Festival of flowers. ❖ Also known as the Ukyam Festival. ❖ It takes place in the Kinnaur district of Himachal Pradesh. ❖ It is celebrated in the month of Bhadrapad (August- September).
Saza	Sazo	❖ Celebrated in the Kinnaur Valley. ❖ Sair festival.
Kalinjar	Minjar Fair	❖ Held in the town of Chamba for one week. ❖ A week-long Festival is celebrated in Chamba Valley during July–August and marks the onset of the monsoon, where a masked dance known as "Cham" is performed.
	Losar	❖ Losar is the Tibetan New Year, famously known for its mask dances, which are called "Cham ". ❖ Celebrated in the Lahaul Spiti Valley.
	Kullu Dussehra	❖ Dedicated to Lord Raghunath.
	Doongri Festival	❖ It is also known as the Hidimba Devi Fair, in honor of Hidimba Devi (wife of Bhima). ❖ It is celebrated in the spring season (around March) for 3 days. ❖ It takes place in the Kullu valley or Manali in Himachal Pradesh.
	Nalwari Fair	❖ It takes place in Bilaspur, Himachal Pradesh. ❖ It lasts for 4 to 5 days and is held at the Luhnu ground. ❖ It is primarily a cattle fair.
	Fagli (Kus/ Kuns)	❖ Punha involves symbolic ploughing indoors using willow sticks, reflecting farming hopes during snow. ❖ Celebrated in Pattan Valley.
	Raulane Festival	❖ A 5,000-year-old traditional, masked cultural festival. ❖ It is celebrated in Kalpa and Kinnaur district of Himachal Pradesh honoring Sauni (mountain fairies) who protect villagers during harsh winter. ❖ The festival welcomes spring, marks the end of winter, and centers on a symbolic, silent divine marriage involving two villagers-the Raula and Raulane-representing celestial beings.
	Chaitrol Festival-	❖ A festival celebrated in Sirmaur district during March-April, known as the "Festival of Pictures," where traditional dishes like Potlu are prepared.

Phulaich

Pori

HARYANA

TRICK TO REMEMBER: *Suraj ki Pin Ganga me Gum ho gayi.*

Trick	Festival	Description
Suraj	Surajkund Mela	❖ An international crafts fair held in Faridabad, Haryana.
Pin	Pinjore	❖ Held in Panchkula district.
Ganga	Gugga Navami	❖ Dedicated to Gugga Pir, worship of snakes.
Gum	Gangaur	❖ Dedicated to Goddess Gauri or Parvati. ❖ Also celebrated in Rajasthan & MP.

JHARKHAND

TRICK TO REMEMBER: *Rohini ka Bhagta Sohar, usko Susu lagi aur usne ye Karam Sarhad pe kar diya.*

Trick	Festival	Description
Rohini	Rohini	❖ It marks the beginning of the sowing season.
Bhagta	Bhagta Parab	❖ To honour Budha Baba celebrated by indigenous tribes of Jharkhand.
Sohar	Sohrai	❖ A Harvest festival is celebrated on the new moon day of Kartik. ❖ Cattle Worship is the primary focus of the Sohrai festival.
Susu	Tusu Parab	❖ Held on the last day of Hindu month Paush.
Karam	Karam	❖ To honour Karam Devta-God of Power and Youthfulness, for a good harvest. ❖ During the Karam festival, a Karam tree is worshipped.
Sarhad	Sarhul	❖ Marks the arrival of Spring.
Jawa	Jawa	❖ Celebrated by unmarried tribal girls for fertility and good agricultural prosperity. ❖ Grains (like barley/jau) are planted in a pot of soil, and as they sprout, they are called 'Jawa'. ❖ Both Karam and Jawa are celebrated around the monsoon season, generally in the Bhadrapada month (August-September).

Trick	Festival	Description
	Santhal Festivals	❖ **Erok Sim & Magh Sim festivals.** ❖ The Santhal community is mainly found in the states of Jharkhand, Bihar, Odisha, and West Bengal.

KARNATAKA

TRICK TO REMEMBER: *Humara kaam wala Abhishek kal apne abba ke sath gaadi Karke aya tha.*

Trick	Festival	Description
Humara	*Hampi*	❖ Also known as "Vijay Utsav".
Kaam wala	*Kambala*	❖ A buffalo race event.
Abhishek	*Maha-mastak-abhisheka*	❖ Held every 12 years Anointment of the Bahubali Gommateshwara statue, located at Shravanabelagola in Karnataka. ❖ Celebrated by the Jain community for Bahubali (son of Rishabhanatha), at Shravanabelagola where his largest statue (~57 ft monolithic) is located; last held in 2018, next in 2030.
Kal	*Pattadakal Dance Festival*	❖ A cultural festival held in January at Pattadakal, showcasing classical dance forms.
Kal	*Kailpodh*	❖ Worship of arms and weapons, celebrated by the Kodava community of Kodagu district.
Abba	*Gombe Habba*	❖ Known as the "Festival of Dolls". ❖ Dolls are placed in odd numbers (usually 9) since it is associated with the Navratri and Dussehra period in Karnataka.
	Gauri Habba	❖ Words ending with "Habba " generally belong to Karnataka. ❖ It is celebrated with the worship of Godess Gouri and is observed one day before Ganesh Chaturthi
Gaadi	*Ugadi*	❖ New Year Festival.
Karke	*Karga*	❖ It is one of the oldest festivals of Bengaluru, celebrated in March–April. ❖ It is celebrated in Tamil Nadu & Karnataka. ❖ The festival lasts for 11 days. ❖ It is celebrated by the Thigala community to honor Draupadi and Shakti.
	Kodava Community Festivals	❖ The Kodava community of Karnataka primarily celebrates three main festivals.
		1. Puthari: ❖ It is the harvest festival (also known as the new rice festival), generally celebrated around December. ❖ The traditional dance performed during this time is called "Ummathat". ❖ The chant "Poli, Poli, Deva" translates to "Increase, Increase, O God." where people pray to God for an abundant harvest.
		2. Kailpodh: ❖ A festival dedicated to weapon worship (weapons are worshipped during this time). ❖ It generally takes place around September.
		3. Kaveri Sankramana: ❖ A river worship festival dedicated to the Kaveri River, generally taking place around October.
	Banashankari Devi Fair	❖ A religious fair held at Badami, dedicated to Banashankari Devi.

KERALA

TRICK TO REMEMBER: *Pooram Vasu they are at Pain because they lost Boat Race on Makar Sankranti.*

Trick	Festival	Description
Pooran	*Thrissur Pooram*	❖ Celebrated in Thrissur during April-May at the Vadakkumnathan temple. ❖ It is known as the "Festival of Festivals".
Vasu	*Vishu*	❖ Vishu is a New Year festival of Kerala that falls in the month of Medam (mid-April).
They	*Theyyam*	❖ Celebrated mostly in North Malabar.
Are	*Arattu*	❖ Held at Sree Padmanabhaswamy Temple.
At	*Attukal Pongal*	❖ Holds the record for the largest gathering of women for a religious purpose. ❖ It is celebrated in Thiruvananthapuram for 10 days. ❖ It is known as the "Sabarimala of Women" because women are not allowed in the Sabarimala temple, whereas only women celebrate Attukal Pongala.

Trick	Festival	Description
Pain	*Painkuni*	❖ Celebrated at Padmanabha Swamy temple.
Boat race	*Vallam Kalli Boat Race*	❖ The Vallamkali boat race takes place during the Onam festival in Kerala. ❖ The boats used in this traditional race are snake-shaped.
On	*Onam*	❖ A Harvest festival welcomes the return of the demon King Mahabali. ❖ Onam is the biggest festival of Kerala, held in Aug-Sept (Bhadrapada month).
Makar Sank-ranti	*Makar Vilakku*	❖ Held at Sabarimala temple, dedicated to Lord Ayyappa.
	Nisha-gandhi	❖ A week- long dance festival is held in the last week of January, every year.
	Thiru-vathira	❖ It is dedicated to honoring Lord Shiva and Goddess Parvati. ❖ It marks the union of Lord Shiva and Parvati, specifically the day Lord Shiva accepted Parvati as his wife. ❖ A central lamp is placed, and women wearing white sarees perform a dance around it. ❖ It is celebrated mainly in the Malayalam month of Dhanu (December-January).
	Manjal Kuli	❖ This is a local name for Holi in Kerala. ❖ It is primarily celebrated by the Kudumbi and Konkani communities of Kerala.
	Guruvayur	❖ It is a 10-day annual festival held at the Sri Krishna Temple. ❖ It takes place around February-March (Chaitra month). ❖ It begins with an elephant race known as 'Aanayottam'. ❖ It concludes with 'Aarattu', which is a holy immersion ceremony.
	Vettukad	❖ It is also known as the 'Feast of Christ the King'. ❖ It is celebrated by the Christian community. ❖ It is a 10-day annual celebration held at the Madre De Deus Church in Vettukad, Thiruvananthapuram, Kerala.
	Chan-danakuda Mahotsa-vam	❖ It is an 11-day annual festival. ❖ It takes place at the Beemapally Dargah Shareef (Masjid) in Thiruvananthapuram. ❖ It is organized in honor of Saint Beema Beevi and her son.

MADHYA PRADESH

TRICK TO REMEMBER: *Ghade me Rang lagake Khajur ka Ras dalke Nagmani rakhke Ganga ke Madhya Gira do aur Bhag jao.*

Trick	Festival	Description
Ghade	*Ghadlya*	❖ Celebrated in the month of Aug-Sept.
Rang	*Lokrang*	❖ Commences on Republic Day.
Khajur	*Khajuraho*	❖ Held in Chhatarpur district.
Ras	*Ras Nawa*	❖ Celebrated by Baigas of Mandla district.
Nagman	*Panchmarhi Utsav*	❖ A 6-day festival.
Ganga	*Gangaur*	❖ Celebrated in Rajasthan and Madhya Pradesh during March-April. ❖ Dedicated to Mata Gauri (an incarnation of Goddess Parvati). ❖ **Ghudliya:** It is the decorated earthen pot with a lamp inside that unmarried girls carry. ❖ **Purpose:** Unmarried girls pray for a good husband, while married women pray for the long life and well-being of their families.
Gira	*Chethiyagi-ri Vihara*	❖ To worship the relics of Sariputta and Mahamogallena, in Sanchi, MP.
Bhag	*Bhagoria Haat*	❖ A harvest festival in the spring season.
	Pola Festival	❖ It is celebrated in Madhya Pradesh (Balaghat), Maharashtra, and Chhattisgarh. ❖ It takes place during the month of Shravan (monsoon) on an Amavasya (New Moon) night. ❖ After completing the heavy field work (plowing /sowing), farmers bathe and decorate their bulls with oil, turmeric, and paints to honor their hard work.
	Dhamoni Urs Fair	❖ The fair is held during the months of April and May. ❖ It takes place at the dargah of Sufi saint Mastan Shah Vali located in Sagar, Madhya Pradesh.
	Laru kaj	❖ It is celebrated by the Bhil & Gond tribe of MP and Chhattisgarh. ❖ Known as the "100-drum festival". ❖ It features a ceremonial pig wedding in honour of Narayana Dev.

Trick	Festival	Description
	Chhabina	❖ The ceremonial procession of Lord Dharanath in the Dhar district of Madhya Pradesh is locally referred to as a Chhabina.
	Malwa Utsav	

MANIPUR

TRICK TO REMEMBER: *Mani aate hi apne Sang Doll and Cherry lai fir Hindon me Nhai.*

Trick	Festival	Description
Mani		Manipur
Sang	*Kang Jatra Kut*	❖ A Hindu festival of Manipur associated with Lord Jagannath Rath Yatra, celebrated for 10 days.
Doll	*Dol Jatra (Yaoshang)*	❖ It is popularly known as the Holi of Manipur. ❖ It is a Spring festival that lasts for about 5 days. ❖ It is celebrated on the full moon day of the Lamta month (February-March). ❖ The festival features sports competitions, not academic quiz competitions. ❖ Thabal Chongbais a moonlight circle dance performed during this festival.
Cherry	*Cherry Blossom*	
Lai	*Lai Haroba*	❖ It is called the "Merry-making of Gods," celebrated by the Meitei community. ❖ It involves the worship of Umang Lai (ancestral forest deities). ❖ Male priests are called 'Maibas' and female priests are 'Maibis'. ❖ The Khamba Thoibi dance is also performed during this time.
Hindon	*Heirku Hidongba*	❖ It is a boat racing festival.
Nhai	*Lui Ngai Ni*	❖ It is a seed-sowing festival (marking the beginning of the agricultural season) celebrated by the Naga tribes of Manipur around December-January.
	Gang Ngai	❖ It is a post-harvest thanksgiving festival celebrated by the Zeliangrong Naga community of Manipur.
	Ningol Chakouba	❖ Focuses on the role of women in society and involves inviting sisters for feasting and gifts.

Trick	Festival	Description
	Cheiraoba (Sajibu)	❖ The New Year of the Meitei community, occurring in March-April.
	Kwak Jatra	❖ It is also known as Kwak Tanba. ❖ It is celebrated in Manipur by the Meitei community. ❖ It is also called the 'Crow Festival' because a crow was released from the king's palace during this festival. ❖ It marks the end of the monsoon season and the beginning of prosperity. ❖ The monsoon ends around September-October, which is why it is celebrated in October.

Cheiroba

Lai Haroba

NAGALAND

TRICK TO REMEMBER: *Nag Bill me Aao, Muh se sakkar khao*

Trick	Festival	Description
Nag		Nagaland
Bill	*Hornbill*	❖ Known for showcasing tribal culture and heritage. ❖ Celebrated from 1-10 December by Naga tribes. ❖ Nagaland's biggest festival ("Festival of Festivals"). ❖ The Hornbill bird symbolizes strength and cultural unity.
Aao	*Aoleang*	❖ It is celebrated in the 1st week of April by the Konyak Naga people.
Muh	*Moatsu Mong*	❖ Celebrated by the Ao Naga tribe (3 days) in the first week of May. ❖ The Ao Naga tribe serves as a time of recreation and joy after the hard work of clearing fields and sowing seeds. ❖ **Sangpangtu:** It is a ritual performed by the Ao tribe during the Moatsu Festival.
Sakkar	*Sekrenyi*	❖ Celebrated by the Angami tribe to invoke prosperity and ward off evil spirits before the sowing season. ❖ Also known as Phousanyi, it takes place in February for purifying the body and soul.

Trick	Festival	Description
	Tuluni	❖ The mid-July harvest festival of the Sumi tribe.
	Tsungrem Mong	❖ It is a pre-harvest festival held in early August (for 3 days).
	Tokhu Emong	❖ The post-harvest festival of the Lotha tribe that lasts for 9 days.
	Nazu	❖ It is celebrated for 10 days by the Pochury tribe. ❖ It takes place in February and marks the beginning of the agricultural season. ❖ 'Khupielilie' dance is specifically performed during this festival.
	Bushu	❖ It is celebrated by the Dimasa Kachari tribe in Nagaland (and Assam). ❖ It is a post-harvest festival (celebrated after the crop harvest). ❖ It takes place in the month of January, and the deity Sibrai is worshipped during this time.
	Lu-Ngai-Ni	

ODISHA

TRICK TO REMEMBER: *6 Khai ya Nau Khai, ye Kaun batayega? Kalinga ke Raja Jo Rath pe baithe hain.*

Trick	Festival	Description
Nau Khai	*Nua Khai*	❖ An agriculture festival where new rice is offered as Prasad. ❖ This newly harvested rice is specifically offered to Maa Samaleswari in Sambalpur, Odisha. ❖ In the local language, "Nua " means new, and "Khai" means food. ❖ "Nabanna" refers to the newly harvested rice. ❖ The famous "Dalkhai" dance is performed to celebrate this festival.
Kaun	*Konark*	❖ A 5-day dance festival held Dec 1-5.
Kalinga	*Kalinga Mahotsav*	❖ 2-day long event. ❖ Martial arts and dance.
Raja	*Raja Prabha*	❖ Also known as Mithun Sankranti. ❖ It can be related to the Ambubachi festival of Assam. ❖ The land is left completely empty for three days. ❖ No sowing, digging, or playing takes place during this period. ❖ It is believed that Goddess Earth is regaining her fertility during this time.

Trick	Festival	Description
Rath	*Rath Yatra*	❖ The chariot journey of Lord Jagannath, Balabhadra, and Subhadra.
	Bal Yatra	
	Nabakale-bara	❖ Celebrated in Jagannath Temple.
	Chhau	
	Chaitra Parab	❖ This festival is celebrated in the Koraput region of Odisha. ❖ It takes place during the month of Chaitra (February-March). ❖ It is associated with Dhemsa dances and drum performances.
	Santhal Festivals	❖ **Erok Sim & Magh Sim festivals.** ❖ The Santhal community is mainly found in the states of Jharkhand, Bihar, Odisha, and West Bengal.

Konark

Rath Yatra

MEGHALAYA

Festival	Description
Shad Suk Mynsiem	❖ A festival of the Khasi tribe known as the "Dance of Peaceful Hearts" and celebrated in the spring season (April), lasting for 3 days.
Nongkrem Festival	❖ A 5-day harvest festival that takes place in Autumn (Oct-Nov), celebrated by the Khasi tribe.
Behdienkh-lam	❖ The monsoon (July) festival of the Jaintia (Pnar) tribe lasts for 3 days. ❖ "Behdien" means to drive away, and "Khlam" means plague (driving away the plague). Therefore, this festival was initially started to drive away plagues or evil diseases.
Shad Sukra	
Wangala	❖ Garo Tribe (aka Festival of Festivals). ❖ It involves the worship of the Sun, the Earth, and agricultural tools to ensure a bountiful harvest. ❖ It is celebrated by the Garo tribe and is also known as the "Festival of 100 Drums".
Strawberry	❖ Held in Ri-Bhoi district.
Cherry Blossom	❖ Held in Shillong.

Festival	Description
Chad Laho (Shad Laho)	❖ It is celebrated as a thanksgiving festival to God after the harvesting season. ❖ It is both a dance and a festival. ❖ It is celebrated by the Garo, Khasi, and Jaintia (Pnar) tribes of Meghalaya during the harvest season.
Agalmaka	❖ It is celebrated by the Garo tribe of Meghalaya. ❖ It is a spring festival and an agricultural festival that takes place around March.

MIZORAM

Festival	Description
Chapchar Kut	❖ A spring festival marking the preparation for maize sowing (March). ❖ "Kut" means festival in the local language. Any festival ending in Kut is generally from Mizoram.
Phawang Kut	
Mim Kut	❖ The cultural significance of "Mim" in the Mim Kut festival is the last harvest representing survival and love.
Pawl Kut	❖ Also known as the "Straw Festival". ❖ It is a harvest festival celebrated in December. ❖ Mim kut, Chapchar Kut and pawl Kut festivals are celebrated by the **Kuki Chin-Mizo** tribes.
Lyuva Khutla	❖ This festival takes place in the month of March and is celebrated by the Mara tribe of Mizoram. ❖ It is celebrated after 'jhuming ' (slash and burn cultivation) is completed. ❖ Festival Host : Chaypi
Anthurium	

Chapchar kut

Mim kut

PUNJAB

Festival	Description
Hola Mohalla	❖ Begins the day after Holi (lasts for 3 days) in Anandpur Sahib. ❖ It was started by Guru Gobind Singh Ji in 1701 for training in martial arts (Gatka). ❖ It showcases martial arts, langars, and Nihang mock battles at Anandpur Sahib.
Gurpurab	❖ Celebrates the birth of Guru Nanak - 1st Sikh Guru. ❖ Martial arts displays by Sikhs.
Lohri	❖ Celebrated the night before Makar Sankranti (Jan 13).
Baisakhi	❖ Baisakhi is celebrated on 13 April, on this specific day in 1699, the 10th Sikh Guru, Guru Gobind Singh Ji, founded the Khalsa Panth (warrior clan). ❖ Marking the Sikh New Year.
Maghi (Makar Sankranti)	❖ A harvest festival. ❖ Lohri is celebrated a day prior.
Chhapar Mela	❖ The fair is held in Chhapar village of Ludhiana district in Punjab. ❖ It takes place in the month of September. ❖ It honors Gugga Pir, who is believed to provide protection against snakes.

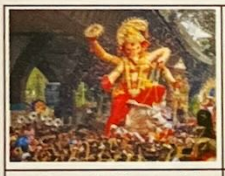
MAHARASHTRA

Festival	Description
Vithoba	❖ Dedicated to the "Vitthal" form of Lord Vishnu.
Gudi Padwa	❖ Symbolises the victory of good over evil. ❖ The New Year of the Marathi community, where a 'Gudi' (decorated victory flag) is hoisted.
Kala Ghoda Mahotsav	❖ 9 days long art festival.
Narali Purnima	❖ The Koli community in Maharashtra celebrates Narali Purnima to pray for safe fishing.
Banganga	❖ It is linked to the legend of Lord Rama and the creation of a freshwater tank.
Vat Purnima	❖ Dedicated to the legendary devotion of Savitri.
Kojagiri Purnima	❖ It is also known as Sharad Purnima. ❖ It is celebrated at the end of the monsoon season (in the month of Ashwin). ❖ It is celebrated by the people of Maharashtra as well as the Bengali community. ❖ In Bengali, Kojagiri means "One who is awake". People stay awake on this day because it is believed that Goddess Lakshmi arrives at night to shower blessings.
Ganesh Chaturthi	❖ Celebrated in Bhadrapada month.
Elephanta	
Pola	❖ It is celebrated in Madhya Pradesh (Balaghat), Maharashtra, and Chhattisgarh. ❖ It takes place during the month of Shravan (monsoon) on an Amavasya (New Moon) night. ❖ After completing the heavy field work (plowing/sowing), farmers bathe and decorate their bulls with oil, turmeric, and paints to honor their hard work.

Festival	Description
Palkhi	
Teej	❖ It is also called Hartalika Teej/Vrat, where women fast for the long life and prosperity of their husbands and children. ❖ This festival in Maharashtra involves worshipping the goddess Parvati and is considered a festival for marital bliss.
Jivati Puja	❖ This puja is exclusively performed by married women. ❖ It is dedicated to Goddess Parvati, as "Jivati" is her incarnation. ❖ It is celebrated every Friday during the month of Shravan. ❖ The Goddess is worshipped as the life-giver and protector of children.

Pola

Gudi Padwa



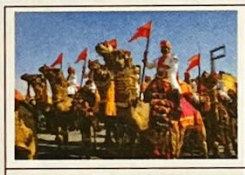
Ganesh Chaturthi

Palkhi festival

RAJASTHAN

Festival	Description
Pushkar Fair	❖ A camel/livestock fair held in Ajmer, Rajasthan during December that also includes religious activities.
Gangaur	❖ Dedicated to Goddess Gauri. ❖ It is celebrated for 18 days. ❖ Celebrated in Rajasthan and Madhya Pradesh during March-April, dedicated to Mata Gauri (an incarnation of Goddess Parvati). ❖ **Ghudliya:** It is the decorated earthen pot with a lamp inside that unmarried girls carry. ❖ **Purpose:** Unmarried girls pray for a good husband, while married women pray for the long life and well-being of their families.
Desert festival	❖ Celebrated in Jaisalmer, Rajasthan, for about 3 days in February.
Nagaur fair	❖ It is also known as the Shri Ramdev Cattle Fair. ❖ It is the second-largest livestock fair, held in Nagaur, Rajasthan.
Chandrabhaga	❖ Held in Kartik month (Oct-Nov).
Bundi Utsav	❖ Held in Kartik month (Oct-Nov).

Festival	Description
Baneshwar Fair	❖ Bhil tribe Dedicated to Baneshwar Mahadev (Lord Shiva). ❖ Held in Dungarpur, Rajasthan, for 5 days. ❖ It is known as the "Kumbh of Tribals".
Kolayat fair	❖ It is named after the great sage Kapil Muni (also called the Kapil Muni Fair). ❖ It is held in Bikaner, Rajasthan during Kartik Purnima. ❖ It includes a ritual at a lake surrounded by banyan trees.
Rajasthan International Folk Festival (RIFF)	❖ RIFF was launched in 2007 and is recognized by UNESCO as a 'Peoples Platform'. ❖ It takes place at Mehrangarh Fort in Jodhpur. ❖ It lasts for 5 days and begins on Sharad Purnima (full moon).
Baran's Dol Mela	❖ It is dedicated to Lord Shree Ji and Raghunath Ji. ❖ Lord Shreeji and Raghunathji's processions on Jaljhulani Gyaras attract traders from several states.



Nagaur

Gangaur

SIKKIM

Festival	Description
Losoong	❖ Bhutia tribe
Namsoong	❖ Lepcha tribe
Losar	❖ Losar is the Tibetan New Year, famously known for its mask dances, which are called "Cham". ❖ It lasts for 15 days, with 3 main event days such as Lama Losar and Gyalpo Losar.
Sakewa	❖ Annual 9-day festival by the Kirat Khambu Rai Community.
Pang Lhabsol	❖ Chu Faat, a sacred folk dance, is performed by the Lepcha tribe of Sikkim during this festival. ❖ It signifies the worship of 5 sacred peaks: Mt. Kanchenjunga, Mt. Kabru, Mt. Simbrum, Mt. Pandim, and Mt. Narshing. ❖ It involves worship of Mount Kanchenjunga and includes prayers, masked dances and local fairs. ❖ It is also known as Pangtoed Cham and takes place in Aug-Sept. It features masked dances.
Saga Dawa	❖ Also known as the Triple Blessed festival. ❖ Sikkim's most sacred, month-long festival that commemorates Lord Buddha's birth, enlightenment, and death (Mahaparinirvana).

Festival	Description
Tendong Lho Rumfaat	❖ Celebrated by the Lepcha community in July/ August to honor Mount Tendong.
Tihar	❖ Diwali is known as Tihar in Sikkim. ❖ Sikkim's Maruni dance is performed during the Tihar festival (Diwali).
Indra Jatra	❖ It is celebrated by the Newar (Nawar) community in Sikkim. ❖ It lasts for 8 days. ❖ It is dedicated to the Rain God (Lord Indra).
Bumchu	❖ A Buddhist festival is held at Tashiding Monastery in Sikkim, where a sacred pot of holy water ("Bumchu") is opened to predict the year's fortune.
Sonam Lochar	❖ Sonam Lochar is a New Year festival of the Tamang people.
Tamu Lochar	❖ Gurung community

UTTARAKHAND

Festival	Description
Harela	❖ Celebrated in the Kumaon region.
Bhitauli	❖ Celebrated in the Kumaon region.
Syaldey Bikhauti Mela	❖ It is celebrated in a place called Dwarahat in the Almora district of Uttarakhand. ❖ It takes place at the Vimandeshwar temple in the month of Baisakh (April-May). ❖ This festival begins with the "Odha Bhetna" (stone striking) ceremony.
Phool Dei	❖ It marks the welcoming of the Spring season. ❖ Young girls gather first-blooming flowers and place them at the doorsteps of houses in the village to wish prosperity. ❖ It is unique to Kumaon Hills.
Kale Kauva (Ghugutiya)	❖ Celebrated on Makar Sankranti.
Kandali	❖ It is celebrated in the Chaundas Valley of Pithoragarh, Uttarakhand. ❖ It is performed by the Rung tribe. ❖ It is held once every 12 years. ❖ The festival starts with the blooming of the Kangdali plant flowers.
Ganga Dussehra	❖ It is celebrated in the months of May and June and lasts for 10 days. ❖ It is celebrated because it is believed that on this day, Goddess Ganga descended from Heaven to Earth.
Bisu Mela	❖ A week-long Jaunsari tribal fair in Chakrata thanking for harvest and honoring Santoora Devi, a Durga form.

Festival	Description
Shakunkhar Mangal Geet	❖ These are associated with the Kumaon region of Uttarakhand. ❖ These Mangal geets (auspicious songs) are sung exclusively by women. ❖ They are sung during different ceremonies like childbirth, marriage, and Ganesh puja.
Baithki Holi	❖ It is celebrated in the Kumaon region of Uttarakhand (known as Kumaoni Baithki Holi). ❖ It mainly takes place around Basant Panchami (January).
Jauljibi Fair	❖ A 13-day trade fair held in Pithoragarh at the confluence of Gori River and Kali River, celebrated in November.

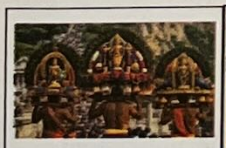
Phool dei

Kandali

TAMIL NADU

Festival	Description
Pongal	❖ Pongal means "to boil". (referring to the traditional dish of boiled milk and rice). ❖ It is a harvest festival of Tamil Nadu that marks the Uttarayan (sun's northward movement / Makar Sankranti). ❖ A 4-day harvest festival (13–16 Jan): ❖ **Day 1 (Bhogi):** Dedicated to cleaning the home and letting go of the old. ❖ **Day 2 (Thai/Surya):** Dedicated to worshipping the Sun God. ❖ **Day 3 (Mattu):** Dedicated to worshipping Cattle. This is when the bull-taming sport Jallikattu is held. ❖ **Day 4 (Kaanum):** A day for family reunions and outings. ❖ **Kolam:** During the Pongal festival, Kolam Rangoli is drawn at the entrance of homes.
Jallikattu	❖ It is a traditional bull-taming event held in Tamil Nadu. ❖ It takes place during the Pongal festival, specifically on the day of Mattu Pongal(which honors cattle).
Puthandu	❖ The Tamil New Year. ❖ Includes ritual baths and temple visits.
Natyanjali	❖ A famous annual classical dance festival in Tamil Nadu, dedicated to Lord Shiva (Nataraja), held at Chidambaram Temple, where the Cosmic dance (Tandava) of Shiva is depicted.

Festival	Description
Karthigai Deepam	❖ This festival is celebrated during November–December. ❖ It is associated with the Arunachaleshwar Temple and is generally linked to Lord Shiva. ❖ During Karthigai Deepam, earthen oil lamps called **"Agal vilakku"** are lit to mark the victory of good over evil.
Thaipusam	❖ Worship of Lord Murugan where Kavadi is carried. ❖ Celebrated on the full moon of the Tamil month Thai, it commemorates the victory of Lord Murugan over the demon Surapadma.
Mahamaham	❖ Known as the "Kumbh of South". ❖ Celebrated once every 12 years.
Kulasai Dasara	❖ This takes place at the Arulmigu Mutharamman Temple in Tamil Nadu. ❖ It lasts for about 10 days during the Navratri period (Sept-Oct). ❖ Devotees wear demon-themed makeup and costumes.
Thiruvathirai	❖ During Thiruvathirai, women swing on mango trees to celebrate womanhood.
Manjal Neerattu Vizha	❖ A turmeric bathing ceremony held when a girl achieves womanhood (first menstruation).
Modhwidsh Festival	❖ The Toda tribe is found in the Nilgiri Hills. ❖ Toda tribes build special huts and worship the buffalo, which is considered very sacred. ❖ "Modhwidsh" is also the New Year festival for the Toda tribe, generally celebrated around December/January.
Karaga	❖ It is celebrated mainly in Tamil Nadu and also in Karnataka. ❖ The festival lasts for 11 days. ❖ It is celebrated by the Thigala community to honor Draupadi and Shakti.



Thaipusam

Jallikattu

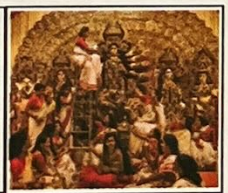
UTTAR PRADESH

Festival	Description
Taj Mahotsav	❖ Celebrated from 17th February to 27th February.
Holi	❖ Celebrated on the Full moon day (Purnima) of Phalgun Month. ❖ It is popularly known as the festival of Colors.
Diwali	❖ Celebrated on the New moon day (Amavasya) of Kartika Month. ❖ It is celebrated to mark the return of Lord Rama to Ayodhya after 14 years of exile.
Kumbh Mela	❖ Major spiritual gathering. ❖ It is held at four Tirthas: Prayagraj, Haridwar, Nasik, and Ujjain. ❖ These are the places where four drops of amrit (nectar) fell during a scuffle between gods and demons.
Eid-ul-Fitr	❖ It signifies the conclusion of Ramadan and is observed by Muslims with fasting, prayers, and communal feasts.
Makar Sankranti	❖ Known as Khichdi.
Chhath Puja	❖ It is a major festival of Bihar and UP dedicated to "Chhathi Maiya" and the Sun God (Surya). ❖ It begins exactly on the 6th day after Diwali. ❖ It is a 4-day long festival celebrated during the Kartik month (around October/November).

WEST BENGAL

Festival	Description
Poila Boishakh	❖ New Year
Durga Puja	❖ It is celebrated with the immersion of elaborately decorated clay idols of Goddess Durga.
Kali Puja	
Dol Purnima	❖ Also known as Dol Jatra.
Kenduli Fair	
Santhal Festivals	❖ **Erok Sim & Magh Sim Festivals.** ❖ The Santhal community is mainly found in the states of Jharkhand, Bihar, Odisha, and West Bengal.
Makar Sankranti	❖ Known as Poush Sankranti.

Poila boisakh



Durga Puja

TELANGANA

TRICK TO REMEMBER: *Bathua Banalu Sam me Padunga*

Trick	Festival	Description
Bathua	*Bathu-kamma*	❖ It is a 9-day floral festival celebrated mainly by women. ❖ A large central arrangement of flowers (called Bathukamma) is made. ❖ It starts on Mahalaya Amavasya (New Moon day). Goddess Gauri and nature are worshipped during this festival. ❖ It takes place during September-October. Celebrated in Telangana and parts of Andhra Pradesh.
Banalu	*Bonalu*	❖ It started in 1813 to eradicate the plague (caused by Yersinia pestis bacteria). ❖ A "Bonam" (food offering) is offered to Goddess Mahakali. ❖ It is mainly celebrated in Hyderabad and Secunderabad, and was declared the Official State Festival of Telangana in 2014. ❖ Potharaju, the brother of Goddess Mahakali, is also worshipped.
Sam	*Sammak-ka Jatara*	❖ Also known as Medaram Jatara. ❖ Rituals of this festival are performed by the Koya tribe.
Padun-ga	*Dunnapo-thula Panduga*	❖ Also Known as Sadar festival. ❖ Celebrated by the Yadava Community.
	Makar Sankranti	❖ It is celebrated for four days with the Bhogi bonfire.
	Ugadi	❖ It signifies the start of the harvest season and the official start of the New Year.

TRIPURA

Festival	Description
Kharchi Puja	❖ It involves a ritual bath in the river and a procession of deities to purify sins and protect against evil spirits. ❖ It involves worship of 14 specific deities. ❖ It lasts for 7 days in the month of July. ❖ It is mainly celebrated in Agartala (the capital of Tripura).
Hojagiri	❖ Celebrated by the Reang community to worship Goddess Mailuma (Laxmi).
Garia Puja	❖ It involves traditional tribal dances and rituals after jhum cultivation.
Bijhu	❖ Celebrated by the Chakma tribe to celebrate the New Year.
Garia Carnival	❖ It is celebrated in Tripura to honor Baba Garia. ❖ The "Ochai" acts as a guide or priest for the entire festival. ❖ It involves the worship of a bamboo pole. ❖ It is celebrated during the month of Chaitra (March-April) and lasts for about 7 days.

LADAKH

Festival	Description
Hemis	❖ It is celebrated at the Hemis Monastery in Ladakh. ❖ It takes place during the months of June-July. ❖ It is celebrated to commemorate the birth anniversary of Guru Padmasambhava. ❖ The famous mask dance known as "Cham " is performed by monks during this festival.
Losar	❖ Losar is the Ladakhi New Year. ❖ During this festival, symbolic dough models of the Sun, the Moon, and the Ibex (a type of mountain animal) are placed in households to welcome the new year.
Saka Dawa	❖ Similar to Sikkim's "Saga Dawa". ❖ It is celebrated in Ladakh around May-June. ❖ It is known as a "Triple Blessed Festival" because it commemorates three major eventsof Lord Buddha: his birth, his enlightenment (Nirvana), and his death (Mahaparinirvana).
Yuru Kabgyat	❖ It takes place at the Lamayuru monastery in Ladakh in the months of July-August. ❖ It is a 2-day festival where the Mask Dance (Chham) is performed.
Dosmoche	❖ Festival of Scapegoats.

DELHI

Festival	Description
International Mango Festival	❖ It is celebrated at Dilli Haat (Janakpuri) in Delhi. ❖ It started in 1987. ❖ It typically takes place in the month of July, where more than 1000 varieties of mangoes are showcased.

PUDUCHERRY

Festival	Description
Veerampat-tinam Festival	❖ It is celebrated to honor the village goddess Sengazhuneer Amman. ❖ It is a 6-day annual event held in the month of August. ❖ A major highlight of this festival is the "car dragging ceremony".

IMPORTANT FESTIVAL

Festival	Description
Makar Sankranti	❖ Makar Sankranti is celebrated across India, marking the sun's northward movement (Uttarayan), entering the Capricorn zodiac (Makar) at the winter solstice.
Paryushana	❖ It involves fasting, prayer, and self-reflection and is observed during the Bhadrapada month. ❖ It is a Jain festival. ❖ It is celebrated in the month of Bhadrapada (August-September).
Shahidi Divas	❖ It commemorates the martyrdom of Guru Arjan Dev. ❖ Guru Arjan Dev was the 5th Sikh Guru. ❖ He was executed by the Mughal Emperor Jahangir for giving shelter to Jahangir's son, Khusrau.
Buddha Purnima	❖ It commemorates the three major life events of Lord Buddha: his birth, his enlightenment, and his death (Mahaparinirvana), also called the "Thrice Blessed Festival.
Kumbh Mela	❖ Major spiritual gathering. ❖ It is held at four Tirthas: Prayagraj, Haridwar, Nasik, and Ujjain. ❖ These are the places where four drops of amrit (nectar) fell during a scuffle between gods and demons.
Maha Shivaratri	❖ It is celebrated as a day of devotion to Lord Shiva and falls on the 14th day of the dark half of the Hindu month Phalguna.
Karva Chauth	❖ It is a festival observed with fasting by married women for their husbands' well-being, typically celebrated in the Hindu month of Kartik.
Bandi Chhor Divas	❖ It commemorates Guru Hargobind's release with 52 kings.
Navroz festival	❖ It is celebrated by the Parsi (Zoroastrian) community. ❖ Balban started the Navroz festival in India.
Tulip Festival	❖ Asia's largest tulip festival is organized in Srinagar.
Diwali	❖ Celebrated on the New moon day (Amavasya) of Kartika Month. ❖ It is celebrated to mark the return of Lord Rama to Ayodhya after 14 years of exile.
Holi	❖ Celebrated on the Full moon day (Purnima) of Phalgun Month. ❖ It is popularly known as the festival of Colors.
Navreh	❖ It is celebrated by Kashmiri Pandits. ❖ It is celebrated on the first day of the Chaitra month, making it the Kashmiri New Year. ❖ Items like walnuts, almonds, and raisins are kept during this festival.
Lohri	❖ It is a popular festival of North India, and is mainly associated with Sugarcane harvesting.
Muharram	❖ First month of Islamic calendar.
Eid-ul-Fitr	❖ It signifies the conclusion of Ramadan and is observed by Muslims with fasting, prayers, and communal feasts.
Barawafat (Eid-e-Milad-un-Nabi)	❖ It commemorates the birth anniversary of Prophet Muhammad, observed on the 12th day (Barah Wafat) of Rabi' al-Awwal.
Zakat al-Fitr	❖ Charity is given during this festival.

INDIAN NEW YEAR

State / Community	Festival	Month
Andhra Pradesh	Ugadi	March-April
Arunachal Pradesh	Mopin (Galo tribe), Longte (Nyishi tribe), Losar (Monpa tribe)	March-April
Assam	Bohag Bihu (Rongali Bihu)	April
Kerala	Vishu	April
Sikkim	Losoong/Sonam Losar	Dec-Jan
Tamil Nadu	Puthandu	April
West Bengal	Poila Boishakh	April
Punjab	Baisakhi	April
Maharashtra	Gudi Padwa	March-April
Parsi Community	Navroz (Jamshedi/Pateti Navroz)	March
Sindhi Community	Cheti Chand	March-April

CENSUS

- Census is the official enumeration of the population conducted periodically by the government.
- ***Frequency:*** In India, it is carried out once in every 10 years.
- ***Conducting authority:*** *Registrar General* and *Census Commissioner of India*, under the *Ministry of Home Affairs* (MoHA).
- ***Legal framework:*** *Census Act, 1948* governs census operations.

History of Census in India

- First city where Census was conducted: *Dacca* (Now Dhaka, Bangladesh) in *1830* by *Henry Walter* (also known as *"Father of Indian Census"*).
- First Census *(Non-Synchronized/Incomplete)* conducted in *1872* {(During *Lord Mayo's* tenure *(1869-1872)*}.
- First (*Synchronized/Complete*) Census conducted in *1881* by the then Census Commissioner of India → *W. C. Plowden* {(During *Lord Ripon's* tenure *(1880-1884)*)}.
- ***First Post-Independence Census:*** *1951*.
- ***Latest Census conducted:*** *2011* (*15th Census* from 1872 and *7th Post-Independence Census*).
- ***Census 2021:*** Census 2021 was not conducted due to *COVID-19* and has been delayed till *October 2024*.

CENSUS 2011

- ***Registrar General of Census 2011:*** *C. M. Chandramouli* (At present: *M K Narayan*) as of *April 2025*.
- ***Motto:*** *"Our Census, Our Future"*.
- ***Data was collected from:*** *35 States/UTs* and *640 Districts*.

Census was conducted in two phases:

- House Listing (April-September 2010).
- Date of Enumeration: *9-28th February 2011*, during population enumeration total *29 questions* were asked to people in this phase.

India's Population in 2011 Census

- ***Total population:*** *1.21 Billion* (1210.2 M).
- ***India's share in world population:*** *17.5%*.
- ***China's share in world population:*** *19.4%*.
- ***Male population:*** *623.7 M (51.54%)*.
- ***Female population:*** *586.46 M (48.46%)*.

Concept of Standard Urban Area (SUA) was introduced during: 1971 Census.

- **Maharashtra has the highest slum population.**
- **Delhi has the highest slum population among UT.**

According to area wise

- ***Highest: Andaman & Nicobar***
- ***Lowest: Lakshadweep***

Highest and Lowest Population

Category	*Highest*	*Lowest*
State	Uttar Pradesh (16% of total population) > Maharashtra > Bihar	Sikkim Mizoram > Arunachal
UT	Delhi	Lakshadweep (State + UT)
District	Thane (Maharashtra)	Dibang Valley (Arunachal Pradesh)
City	Mumbai	Kapurthala (Punjab)

Highest crude death rate: 1901-1921

Growth Rate

- ***Average annual growth rate (2001-2011):*** *1.64%*.
- ***Decadal growth rate (2001-2011):*** *17.64%* (Total increase: 181 M (18.19 Cr) people} → Male: *17.19%* and Female: *18.12%*.
- ***As per 1901 Census:*** *238 M*.
- ***According to 1951 Census:*** *361 M*.
- ***Highest decadal growth rate (1961-1971):*** *24.8%*.
- ***Lowest decadal growth rate (1911-1921):*** *-0.31%* (Reason: Due to *famine*).

Year of the Great Divide (1921) Reason:

- **Before 1921: High death rate, unstable population**
- **After 1921: Declining death rate, rising population**

Category	*Highest*	*Lowest*
State	Meghalaya (27.8%) > Arunachal Pradesh Bihar	Nagaland (-0.47%) > Kerala > Goa
UT	Dadra & Nagar Haveli (55.5%)	Lakshadweep (6.23%)
District	Kurung Kumey (Arunachal Pradesh; 111%)	Longleng (Nagaland)

Child Population *(0-6 years)*

- ***Total:*** *158.8 M* (13.1% of the population) → *0.38%* decreased as compared to *2001*.
- ***Highest population:*** *Uttar Pradesh*.
- ***Lowest population:*** *Lakshadweep*.
- ***District wise:*** *Kupwara, J & K* (highest) and *Dibang Valley, Arunachal Pradesh* (lowest).

Sex Ratio *(Females per 1000 Males)*

The sex ratio refers to the number of females *per 1000 males* in a given area at a specified time period.

- ***As per 2011 Census:*** *943*.
- ***As per 2001 Census:*** *933*.

Category	Highest	Lowest
State	Kerala (1084) > Tamil Nadu (996) >Andhra	Haryana (879) > J & K (889)
UT	Puducherry (1037) Lakshadweep (900)	Daman & Diu (618) > Dadra & Nagar Haveli (774)
District	Mahe (Puducherry)	Daman

Child Sex Ratio (0-6 years)

- *As per 2001 Census:* 927.
- *As per 2011 Census:* 919.

According Provisional Census: 914

Category	Highest	Lowest
State	Arunachal Pradesh (972) > Mizoram	Haryana (834)
UT	Andaman & Nicobar (968)	Daman & Diu
District	Lahaul and Spiti Valley (Himachal Pradesh)	Jhajjar (Haryana)

**As per Census 2011, Maharashtra recorded negative growth in child sex ratio.

Literacy Rate

- In India, only people aged *7 and above* are considered for calculating literacy rates.
- A person is considered literate if they can read and write with understanding in any language.

Adult (above 15 yrs) literacy: 69.3%

Overall Literacy Rate

- *As per 2001 Census:* 64.83% → *Male:* 75.85% *and Female:* 54.16%
- *As per 2011 Census:* 74.04% → *Male:* 82.14% *and Female:* 65.46%.

} *Increase in Literacy Rate:* 9.2%

- *As per provisional Census 2011, the literacy rate is* 72.98% → *Male:* 80.9% *and Female:* 64.63%.
- *Difference in male and female literacy rate:* 16.68%.
- State with highest difference in male and female literacy rate: *Rajasthan (27.85%)*, 2nd: *Jharkhand*.
- State with least difference in male and female literacy rate: *Meghalaya* and 2nd: *Kerala*.
- During last decade highest improvement in literacy rate was observed in Rural Females.

Provisional: Preliminary or tentative data that is subject to revision.

Category	Highest	Lowest
State	Kerala (94%) > Mizoram (91.33%)	Bihar (61.8%) Arunachal Pradesh (65.38%)
UT	Lakshadweep (91.85%)	Dadra & Nagar Haveli (77.24%)
District	Serchhip (Mizoram)	Alirajpur (Madhya Pradesh)

Literacy Rate Gender-wise

- *Male (highest):* Kerala.
- *Female (highest):* Lakshadweep/ Kerala.
- *Male (lowest):* Bihar
- *Female (lowest):* Bihar

Literacy Rate Category-wise

(According to 2011 Census)

- *Scheduled Caste:* 66.1%.
- *Scheduled Tribe:* 59%.

Population Density

- It is the measure of the number of individuals per square kilometre.
- *As per 2001 Census:* 325.
- *As per 2011 Census:* 382.

Category	Highest	Lowest
State	Bihar (1106) West Bengal > Kerala	Arunachal Pradesh (17) > Mizoram (52)
UT	Delhi (11,320) > Chandigarh	Andaman & Nicobar (46)
District	NE Delhi	Dibang Valley (Arunachal Pradesh)

Rural and Urban Divide

- *Rural:* 833.1 M (68.8%).
- *Top 3 States:* Uttar Pradesh > Bihar > West Bengal.
- *Bottom 3 States:* Sikkim > Mizoram > Goa.
- *Urban:* 377.1 Million (31.2%).
- *Top 3 States:* Maharashtra > Uttar Pradesh > Tamil Nadu.
- *Bottom 3 States:* Sikkim > Arunachal Pradesh > Mizoram.

- **Highest% of rural population:** Dadra & Nagar Haveli (among UTs)
- **Highest % of urban population:** Delhi

Percentage-wise Rural and Urban Divide

- *Rural (highest):* Himachal Pradesh (89.9%) > Bihar (88.7)> Assam 85.92%).
- *Urban (highest):* Goa (62.17%) > Tamil Nadu (48.4%) > Kerala 47.7%).

Caste-Based Population

Scheduled Caste (SC) Population: 201 Million (16.6% of the total population).

- *Highest population:* Uttar Pradesh.
- *Highest percentage-wise population:* Punjab.
- *Lowest population:* Mizoram.
- *Lowest percentage-wise:* Mizoram.
- *State/UTs with 0% SC population:* Nagaland, Arunachal Pradesh, Andaman & Nicobar, Lakshadweep.

Scheduled Tribe (ST) Population: 104.3 Million (8.6% of the total population).

- ***Highest population:*** *Madhya Pradesh*.
- ***Highest percentage-wise population:*** *Lakshadweep*.
- ***Lowest population:*** *Haryana* > *Punjab* > *Delhi* > *Puducherry* > *Chandigarh* (these three states have zero ST population).

Religion Based

Religious group	Population % 1951	Population % 1961	Population % 1971	Population % 1981	Population % 1991	Population % 2001	Population % 2011
Hindu	84.1%	83.45%	82.73%	82.30%	81.53%	80.46%	78.35%
Muslim	9.8%	10.69%	11.21%	11.75%	12.61%	13.43%	14.2%
Christian	2%	2.44%	2.60%	2.44%	2.32%	2.34%	2.34%
Sikh	1.89%	1.79%	1.89%	1.92%	1.94%	1.87%	1.87%
Buddhist	0.74%	0.74%	0.70%	0.70%	0.77%	0.77%	0.77%
Jain	0.46%	0.46%	0.48%	0.47%	0.40%	0.41%	0.41%
Parsi	0.13%	0.09%	0.09%	0.09%	0.08%	0.06%	0.06%
Animist, others	0.43%	0.43%	0.41%	0.42%	0.44%	0.72%	0.72%

Table 1: Population Trends for major Religious Groups in India (1951-2011 Census)

- *Hindu* population declined by: *0.7 pp.*
- *Sikh* population declined by: *0.2 pp.*
- *Buddhist* population declined by: *0.1 pp.*
- *Muslim* population declined by: *0.8 pp.*

pp: Percentage point

- Highest decadal growth rate: *Muslims (24.6%)*→ they are *least literate*.
- Lowest decadal growth rate: *Jains* (they have the highest literacy rate amongst all the communities).

Religious Groups	Population in millions			Decadal Growth rate	
	1991	2001	2011	1991-2001	2001-2011
Hindu	687.65	827.58	966.26	20.35	16.76
Muslim	101.60	138.19	172.25	36.02	24.65
Christian	19.64	24.08	27.82	22.61	15.53
Sikh	16.26	19.22	20.83	18.18	8.42
Buddhist	6.39	7.96	8.44	24.54	6.13
Jain	3.35	4.23	4.45	26.02	5.37
Other	3.68	7.37	10.81	99.93	46.66

Source: Census of India (decadal growth rate is calculated by the authors)

Table 2: Religion-based Decadal Growth Rate

- State with largest Buddhist and Jain population: *Maharashtra*.
- State with largest Christian population: *Kerala*.
- State with largest Hindu population: *UP*.
- State with largest Muslim population: *J&K*.
- Highest % of Hindu population: *Himachal*.
- Highest % of Muslim population: *Lakshadweep (96.58%)*.

Demographic Dividend

- A demographic dividend is a period of economic growth that happens when a country's population ages and the working-age population increases
- ***Working age group in India:*** *15-64 or 15-59*.

Work Force in India

- Male work force participation: *53.26%*.
- Female work force participation: *25.5%*.
- *Himachal* has the highest female LFPR (Labor Force Participation Rate) in *rural* India (47.4%).
- *Tamil Nadu* has the highest female LFPR in *urban* India.

Migration Trends

- Highest out-migration states: *Uttar Pradesh* > *Bihar*.
- Highest in-migration state: *Maharashtra*.
- Percentage of total migrants from Nepal: *15.1%*.
- Percentage of total migrants from Sri Lanka: *2.9%*.

Main Reason for Migration

- ***For men:*** Work and employment.
- ***For women:*** Marriage.

- ***The 1st Socio-Economic and Caste Census (SECC) was first conducted in 1931 by Ministry of Rural Development.***
- ***According to 2011 Census, 2.21% of India's population (i.e. 26.8 Million) were identified as disabled.***
- ***Adolescent population:*** *21% (10-19 yrs).*

Language

Language	*Speakers (M)*	*Speakers% in Population*
Hindi	692	57.1
English	129	10.6
Bengali	107	8.9
Marathi	99	8.2
Telugu	95	7.8
Tamil	77	6.3
Gujarati	60	5
Urdu	63	5.2
Kannada	59	4.9
Malayalam	36	2.9
Punjabi	36	3
Assamese	24	2
Maithili	14	1.2
Sanskrit	0.025	0.3 (Least speaking population)

CENSUS 2011

- ***Population according to 1951 Census:*** *361 M.*
- ***Literacy rate:*** *18.33%*→ Male *(27.16%)* and Female *(5.56%)*.
- ***Sex ratio:*** *946*.
- ***Population density:*** *117*.

Miscellaneous Facts

- *Census 2024* will be conducted through *Census Management and Monitoring System* (CMMS) which is a *Digitalized System.*
- *National Population Policy (NPP) 2000:* It aims to achieve a stable population by *2045*.

JANUARY

- *1st:* English New Year / Global Family Day.
- *4th:* World Braille Day.
- *5th:* National Birds Day.
- *6th:* World War Orphans Day."
- *9th:* Pravasi Bhartiya Diwas → *Non-Resident Indian (NRI) Day.*
- *10th:* World Hindi Diwas.

International Days are recognised by United Nations.

- ***Hindi was first spoken at the* UN General Assembly (UNGA) in 1949.**
- ***This date is also commemorated as* "World Hindi Day".**

- *11th:* Death Anniversary of Lal Bahadur Shashtri.
- *12th:* National Youth Day → On *12 January 1863, Swami Vivekananda* was born.
- *15th:* Army Day.

Reasons for celebration of Army Day:

- To commemorate the appointment of *Field Marshal K.M. Cariappa as the first Indian Commander-in-Chief* of the Indian Army.

- *16th:* Startup Diwas
- *23rd:* Netaji's Birthday (S.C. Bose) →This day is also celebrated as *Parakaram Divas*.

ECI was established on 25th Jan 1950.

- 24th: National Girl Child Day.
- *25th:* National Voters Day
- *26th:* International Customs Day.
- *27th:* International Holocaust Day; International Tourism Day.
- *28th:* Birth Anniversary of Lala Lajpat Rai; Data Protection Day.
- *30th:* Martyr's Day (also known as *Mahatma Gandhi's* martyrdom day); World Leprosy Eradication Day.
- *31st:* International Zebra Day.

FEBRUARY

- *1st:* Indian Coast Guard Day.
- *2nd:* World Wetlands Day → On this day, *Ramsar Convention* was adopted in 1971 in *Ramsar, Iran*.
- *4th:* World Cancer Day.
- *6th:* International Day of Zero tolerance for Female Genital Mutilation.
- *6th-12th Feb:* International Development Week.
- *8th:* Safer Internet Day.
- *10th:* National Deworming Day; World Pulses Day.
- *11th:* World Day of the Sick; Int. Day of Women and Girls in Science.
- *21st:* International Mother Language Day.
- *22nd:* World Thinking Day.
- *24th:* Central Excise Day.
- *27th:* World NGO Day.
- *28th:* National Science Day.

- **Sarva Dava Sewan is a program that aims to eliminate lymphatic Filariasis by 2027.**
- **National Filaria Control Programme (NFCP) was launched in 1955 to eliminate lymphatic Filariasis.**
- **28 February 1928, Sir C. V. Raman and his student K. S. Krishnan discovered the Raman effect for which Raman received Nobel Prize in Physics in 1930 and Bharat Ratna in 1954.**

MARCH

- *1st:* Zero Discrimination Day.
- *3rd:* World Wildlife Day.
- *4th:* National Safety Day.
- *8th:* International Women's Day.
- *2nd Wednesday of March:* No Smoking Day.
- *10th:* CISF Raising Day.
- *14th:* Pi Day.
- *15th:* World Consumer's Right Day.
- *16th:* National Vaccination Day.
- *20th:* International Day of Happiness; World Sparrow Day.
- *21st:* International Day of Forests.
- *22nd:* World Water Day.
- *23rd:* World Meteorological Day.
- *24th:* World Tuberculosis (TB) Day.

The last Saturday of March: Earth's Hour Day →It is celebrated from 8:30 pm to 9:30 pm local time, encouraging people to turn off non-essential lights for an hour to raise awareness about environmental issues.

APRIL

- *1st:* Odisha Foundation Day; April Fool's Day.
- *1st-7th:* Prevention of Blindness Week.
- *2nd:* World Autism Awareness Day.
- *5th:* National Maritime Day.
- *7th:* World Health Day → On *1948, World Health Organization (WHO)* was established.
- *10th:* World Homoeopathy Day.
- *13th:* Jallianwala Bagh Massacre Day.

- ***14th:*** B.R Ambedkar Remembrance Day.
- ***17th:*** World Haemophilia Day.
- ***18th:*** World Heritage Day.
- ***21st:*** National Civil Services Day.
- ***22nd:*** World Earth Day.
- ***24th:*** National Panchayati Raj Day → ***73rd CA 1992*** constitutionalised Panchayati Raj system in India.
- ***25th:*** World Malaria Day.
- ***26th:*** World Intellectual Property Day.
- ***28th:*** World Day for Safety and Health at Work.

In haemophilia, blood does not clot due to deficiency of certain clotting factors.

MAY

- ***1st:*** International Labour Day; Maharashtra Day; Gujarat Day.
- ***3rd:*** Press Freedom Day.
- ***7th:*** World Athletics Day.
- ***8th:*** World Red Cross Day; World Thalassemia Day (Thalassemia occurs when body does not make enough hemoglobin).
- ***9th:*** Rabindranath Tagore Jayanti.
- ***11th:*** National Technology Day.
- ***12th:*** International Nurses Day → ***Florence Nightingale*** was the founder of ***modern nursing*** (lady with a lamp).
- ***16th:*** Buddha Jayanti or Buddha Purnima.
- ***17th:*** World Telecommunication Day, World Hypertension Day.
- ***18th:*** International Museum Day.
- ***21st:*** National Anti-Terrorism day/Tea Day.
- ***25th:*** Thyroid Day.
- ***31st:*** Anti-Tobacco Day.

***World Laughter Day* (First Sunday *of May*).**

***Mother's Day* (Second Sunday *of May*)**

JUNE

- ***1st:*** World Milk Day.
- ***2nd:*** International Sex Workers' Day.
- ***2nd:*** Telangana Formation Day.
- ***5th:*** World Environment Day.
- ***7th:*** World Food Safety Day.
- ***8th:*** World Oceans Day.
- ***12th:*** World Day Against Child Labour.
- ***14th:*** World Blood Donor Day.
- ***20th:*** World Refugee Day.
- ***21st:*** International Yoga Day.
- ***23rd:*** International Olympic Day.
- ***27th:*** Micro, Small and Medium-sized Enterprises (MSME) Day.
- ***29th:*** National Statistics Day → It is celebrated on the birth anniversary of ***P C Mahalanobis.***

JULY

- ***1st:*** National Doctor's Day; National Postal Worker Day; Chartered Accountants Day.
- ***11th:*** World Population Day → On this day the world population reached ***5 Billion.***
- ***26th:*** Kargil Vijay Diwas
- ***28th:*** World Hepatitis Day; Nature Conservation Day.
- ***29th:*** International Tiger Day.

The ***St. Petersburg Declaration*** on Tiger Conservation was made on ***29th July 2010*** which aimed to raise awareness about tigers and the efforts to protect them.

AUGUST

- ***6th:*** Hiroshima Day (On ***1945***, an atomic bomb named ***"Little Boy"*** was dropped on ***Hiroshima, Japan***).
- ***7th:*** National Handloom Day; National Javelin Day.
- ***8th:*** Quit India Movement Day.
- ***9th:*** Nagasaki Day (On this day, an atomic bomb named ***"Fat Man"*** was dropped on ***Nagasaki, Japan***); International Day of the World's Indigenous Peoples.
- ***12th:*** International Youth Day; World Elephant Day.
- ***13th:*** World Organ Donation Day.
- ***15th:*** National Mourning Day (Bangladesh); Independence Day in India.
- ***16th:*** Parsi New Year ***(Nowruz)***.
- ***19th:*** World Humanitarian Day.
- ***20th:*** World Mosquito Day; Sadbhavna Diwas.
- ***26th:*** Women's Equality Day.
- ***29th:*** National Sports Day →This day is observed as the birth anniversary of ***Major Dhyanchand.***

***Friendship Day* (First Sunday *of August*).**

SEPTEMBER

- ***1st-7th:*** National Nutrition Week
- ***5th:*** International Day of Charity; Teachers' Day (it is celebrated to honour the birth anniversary of ***Dr. Sarvepalli Radhakrishnan*** in India).
- ***8th:*** International Literacy Day.
- ***10th:*** World Suicide Prevention Day (WSPD).
- ***14th:*** World First Aid Day; Hindi Diwas → On ***1949, Hindi*** was adopted as the ***official language of India.***
- ***15th:*** Engineer's Day (India); International Day of Democracy.

- ***16th:*** World Ozone Day → In *1987*, at *Montreal, Canada, Ozone Convention* was held.
- ***21st:*** International Day of Peace (UN); World Alzheimer's Day.
- ***22nd:*** Rose Day → It is celebrated for the welfare of *Cancer patients*.
- ***26th:*** Kargil Vijay Diwas.
- ***28th:*** World Hepatitis Day; Nature Conservation Day.
- ***29th:*** International Tiger Day.
- ***22nd:*** World Rhino Day.
- ***27th:*** World Tourism Day.

World Maritime Day → It is celebrated on the last Thursday of September every year.

OCTOBER

- ***1st:*** International Day of the Older Persons.
- ***2nd:*** Gandhi Jayanti; International Day of Non-Violence.
- ***5th:*** World Teachers' Day.
- ***8th:*** Indian Air Force Day.
- ***9th:*** World Postal Day.
- ***10th:*** World Mental Health Day.
- ***11th:*** International Day of the Girl Child.
- ***13th:*** International Day for Disaster Risk Reduction.
- ***17th:*** International Day for the Eradication of Poverty.
- ***20th:*** World Statistics Day.
- ***24th:*** United Nations Day; World Development Information Day
- ***31st:*** Rashtriya Ekta Diwas or National Unity Day → It is celebrated as the birth anniversary of *Sardar Vallabhbhai Patel* (he was the first Home Minister of India).

NOVEMBER

- ***1st:*** Formation Day of 8 States *(Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Haryana, Punjab, Chhattisgarh, Madhya Pradesh)*.
- ***6th:*** International Day for Preventing the Exploitation of the Environment in War and Armed Conflict.
- ***7th:*** Infant Protection Day; National Cancer Awareness Day.
- ***11th:*** National Education Day.
- ***14th:*** World Diabetes Day; Children's Day
- ***19th:*** International Men's Day; World Toilet Day.
- ***25th:*** International Day for the Elimination of Violence against Women.
- ***26th:*** Constitution Day of India → On *26th November 1949*, our *Indian Constitution was adopted*.
- ***29th:*** International Day of Solidarity with Palestinian People.

DECEMBER

- ***1st:*** World AIDS Day.
- ***2nd:*** National Pollution Control Day; Computer Literacy Day; International Day for the Abolition of Slavery.
- ***3rd:*** International Day of Persons with Disabilities.
- ***4th:*** Indian Navy Day.
- ***5th:*** International Volunteer Day; World Soil Day.
- ***7th:*** Armed Forces Flag Day; International Civil Aviation Day.
- ***9th:*** International Anti-Corruption Day.
- ***10th:*** Human Rights Day.
- ***11th:*** International Mountain Day.
- ***14th:*** National Energy Conservation Day.
- ***16th:*** Vijay Diwas →This day is celebrated (16th December 1971) to commemorate India's victory over Pakistan in Indo-Pak War.
- ***18th:*** Minorities Rights Day in India; International Migrants Day.
- ***19th:*** Goa's Liberation Day (*Operation Vijay* carried out in *1961* that led to the liberation of *Goa, Daman, and Diu* from *Portuguese* rule); National Integration Day (it is celebrated to honour the birth anniversary of *Indira Gandhi*).
- ***20th:*** International Human Solidarity Day.
- ***22nd:*** National Mathematics Day (*Ramanujan Day*) → This day is celebrated as birth anniversary of *Ramanujan*.
- ***23rd:*** Kisan Diwas.
- ***24th:*** National Consumer Rights Day.
- ***25th:*** National Good Governance Day. It is observed as the birth anniversary of *Atal Vihari Vajpayee* (1954).
- ***26th:*** Veer Bal Diwas. It is celebrated to commemorate the extraordinary sacrifices made by the four sons of *Guru Gobind Singh Ji*.
- ***31st:*** New Year's Eve.

BOOKS BY SPORTS PERSONALITIES

AUTHOR	BOOK TITLE
Sanjay Manjrekar	• *Imperfect*
Devendra Prabhudesai	• *The Nice Guy Who Finished First: A Biography of Rahul Dravid*
Yuvraj Singh	• *The Test of My Life*
Sachin Tendulkar, Boria Majumdar	• *Playing It My Way*
Sourav Ganguly	• *A Century is Not Enough: My Roller-Coaster Ride to Success*
Kapil Dev	• *Straight from the Heart*
Sunil Gavaskar	• *Straight Drive*
Shane Warne	• *No Spin: My Autobiography*
Milkha Singh	• *The Race of My Life*
Sania Mirza	• *Ace Against Odds*
Saina Nehwal	• *Playing to Win*
Abhinav Bindra	• *A Shot at History*
Usain Bolt	• *Faster than Lightning: My Autobiography*
Mary Kom	• *Unbreakable: An Autobiography*
Vishwanathan Anand	• *Mind Master: Winning Lessons from a Champion's Life*
Major Dhyan Chand	• *Goal*
Anil Kumble	• *Wide Angle*
David Beckham	• *My Side*
Mike Tyson	• *Undisputed Truth: My Autobiography*
Maria Sharapova	• *Unstoppable: My Life So Far*
Muhammad Ali	• *The Soul of a Butterfly: Reflections on Life's Journey*
Ashish Ray	• *Cricket World Cup: The Indian Challenge*
Chris Gayle	• *Six Machine: I Don't Like Cricket...I Love It.*
Shane Watson	• *The Winner's Mindset*

BOOKS BY POLITICAL AND HISTORICAL FIGURES

AUTHOR	BOOK TITLE
A. P. J. Abdul Kalam	• *Wings of Fire: An Autobiography* • *Ignited Minds* • *My Journey: Transforming Dreams Into Action* • *My India: Ideas for the future* • *Mission India: A vision for Indian Youths* • *The Scientific Indian* • *The Life Tree (Poems)* • *India 2020: A Vision for the New Millennium*
A. P. J. Abdul Kalam	• *What Can I Give?* • *Reignited: Scientific Pathways to a Brighter Future* • *Beyond 2020: A Vision for Tomorrow's India*
Fali S. Nariman	• *Before Memory Fades: An Autobiography*
Surendranath Banerjee	• *A Nation in Making*
General V. K. Singh	• *Courage and Conviction: An Autobiography*
Margaret Alva	• *Courage and Commitment: An Autobiography*
Barack Obama	• *Dreams from My Father: A Story of Race and Inheritance*
Arnold Schwarzenegger	• *Total Recall: My Unbelievable True Life Story*
Anne Frank	• *The Diary of a Young Girl*
Kiran Bedi	• *Fearless Governance*
Benazir Bhutto	• *Daughter of Destiny: An Autobiography*
Mahatma Gandhi	• *The Story of My Experiments with Truth* • *Hind Swaraj*
Lala Lajpat Rai	• *Young India: An Interpretation and A History of the Nationalist Movement from Within*
Hillary Rodham Clinton	• *Living History* • *What Happened*
Jawaharlal Nehru	• *An Autobiography: Toward Freedom* • *Glimpses of World History* • *Letters From A Father to His Daughter* • *The Discovery of India* • *A Bunch of Old Letters*
Maulana Abul Kalam Azad	• *India Wins Freedom*
The 14th Dalai Lama	• *Freedom in Exile*
Nelson Mandela	• *Long Walk to Freedom*
L. K. Advani	• *My Country My Life*
Bhagat Singh	• *Why I Am an Atheist* • *My Master*
Swami Vivekananda	• *Raja Yoga* • *Karma Yoga*
Dadabhai Naoroji	• *Poverty and Un-British Rule in India*
Pranab Mukherjee	• *The Coalition Years*
B. R. Ambedkar	• *Riddles in Hinduism* • *Ranade, Gandhi and Jinnah* • *Waiting For A Visa: Autobiographical Notes* • *Annihilation of Caste* • *The Buddha and His Dhamma*

AUTHOR	BOOK TITLE
Indira Gandhi	• *My Truth*
Sarojini Naidu	• *The Golden Threshold*
P. Chidambaram	• *Speaking Truth to Power: My Alternative View*
Al-Biruni	• *Kitab-ul-Hind*
Manmohan Singh	• *The Quest For Equity in Development*
Sarvepalli Radhakrishnan	• *The Brahma Sutra: The Philosophy of Spiritual Life*
S.H. Raza	• *Bindu*
Joan Aiken	• *Midnight is a Place*
Orhan Pamuk	• *Snow*
Sarat Chandra Chattopadhyay	• *The Home and the World*
Chitta Ranjan Das	• *India for Indians*
S. Jaishankar	• *Why Bharay Matters*
Bankim Chandra Chattopadhyay	• *Vande Mataram*
V.D. Savarkar	• *The Indian war of Independence*
Lala Lajpat Rai	• *The Story of My Deportation*
Maneka Gandhi	• *Brahma's Hair*
Dr. Rajendra Prasad	• *Satyagraha in Champaran*
Shashi Tharoor	• *The Great Indian Novel* • *An Era of Darkness* • *Paradoxical Prime Minister* • *Why I am a Hindu* • *Ambedkar: A Life* • *Pride Prejudice and Punditry* • *Riot: A Novel* • *The Five Dollar Smile and other stories* • *The Struggle for India's Soul*
Michelle Obama	• *Becoming*
Bill Gates	• *The Road Ahead*
Arjun Singh	• *A Grain of Sand in the Hourglass of Time: An Autobiography*
Sheikh Muhammad Abdullah	• *Aatish-e-Chinar*
Amit Shah	• *Karmayoddha Granth*
Faizi and Abdal Qadir Badauni	• *Razmnama*
Dina Bandhu Mitra	• *Neel Darpan*
Bankim Chandra Chattopadhyay	• *Anandmath*
Adolf Hitler	• *Mein Kampf*
Megasthenes	• *Indica*
Jyotibha Phule	• *Gulamgiri* • *Sarvajanik Satyadharma*
Hiuen Tsiang	• *Si-Yu-Ki*

AUTHOR	BOOK TITLE
Malik Muhammad Jayasi	• *Padmavat*
Tarabai Shinde	• *Stripurush Tulna*
Bal Gangadhar Tilak	• *The Arctic Home In The Veda*
Stephen Hawking	• *A Brief History of Time*
Charles Darwin	• *On the Origin of Species*
Jaswant Singh	• *Defending India*
Bipin Chandra Pal	• *Memories of My Life and Time in the Days of My youth*
Rassundari Devi	• *Amar Jiban*
Annie Besant	• *New India* • *Common Weal*
Narendra Modi	• *Social Harmony*
James Mill	• *The History of British India*
Firdausi	• *Shahnama (In Arabic)*
Ibn Battuta	• *Rihla*
Al Masudi	• *The Meadows of Gold*

BOOKS BY INDIAN AUTHORS CLASSICAL OLD INDIAN WRITERS

AUTHOR	BOOK TITLE
Panini	• *Ashtadhyayi*
Kalidasa	• *Raghuvamsha* • *Kumarasambhava* • *Malvikagnimitra* • *Ritusamhara* • *Meghaduta* • *Abhijnana Shakuntalam*
Rabindranath Tagore	• *Gitanjali* • *A Grain of Sand* • *Kabuliwala* • *Nationalism* • *Galpaguchchha* • *Chokher Bali* • *The Postmaster*
Raja Rao	• *Kanthapura* • *The Serpent and The Rope*
Sarngadeva	• *Sangita Ratnakar (Sanskrit text)*
Tulsidas	• *Ramcharitmanas*
Jayadeva	• *Gita Govinda* • *Ashtapadi (24 Sanskrit Poems)*
Sri Aurobindo	• *The Life Divine* • *The Secret of Veda*
Vishnu Sharma	• *Panchatantra*
Vatsyayana	• *Kama Sutra*
Paramhansa Yogananda	• *Autobiography of a Yogi*
Kalhana	• *Rajatarangini*

AUTHOR	BOOK TITLE
Asvaghosha	• *Buddhacharita*
Chithalai Chathanar	• *Manimekhalai: The Dancer with the Magic Bowl*
Sage Jamini	• *Mimasa Sutras*
Sant Dhyaneshwar	• *Bhavartha Dipika* • *Amritanubhava*
Bhaskara	• *Lilavati*
Allasani Peddana	• *Manu Charitra*
Bhavabhuti	• *Malatimadhava (Playwright)*
Munshi Premchand	• *Godan* • *Gaban* • *Kaphan* • *Nirmala* • *Namak ka Daroga* • *Idgah* • *Mansarovar*
Adikavi Pampa	• *Vikramarjuna Vijaya*
Nandikeshvara	• *Abhinaya Darpan*
Harivansh Rai Bachchan	• *In The Afternoon of Time: An Autobiography* • *Madhushala* • *Need ka Nirman Fir Fir* • *Milan Yamini* • *Do Chattanein*
R. K. Narayan	• *The English Teacher* • *Malgudi Days* • *Swami and Friends* • *The Dark Room* • *The Guide* • *The Painter of Signs* • *The Dateless Diary*
Vrindavan Lal Sharma	• *Mrignayani*
Mulk Raj Anand	• *Untouchable* • *Coolie* • *Sword and Sickle* • *The Village* • *Across the Black Waters* • *Seven Summers* • *Two leaves & a bud*
Kabir Das	• *Bijak*
Patanjali	• *Mahabhashya*
Srimanta Sankardev	• *Kirtan-Ghosha*
Maya Asura & Latadeva	• *Surya Siddhanta*
Pitambar Das	• *Ek baar bidaye de ma*
Pandit Ravi Shankar	• *My Life, My Music*
Amir Khusro	• *Nuh-i-Sipihr* • *Khazain-ul-Futuh* • *Tughalaqnama*

NEW AND MODERN INDIAN WRITERS

AUTHOR	BOOK TITLE
Vikram Seth	• *A Suitable Boy* • *The Golden Gate* • *An Equal Music* • *A Suitable Girl* • *From Heaven Lake: Travels Through Sinkiang and Tibet* • *Breaking Tales* • *Two Lives*
Khushwant Singh	• *A Train to Pakistan* • *Truth, Love and a Little Malice* • *Karma* • *The History of the Sikhs* • *Sex Scotch and Scholarship* • *Delhi: A Novel* • *I Shall Not Hear the Nightingale*
Sudha Murthy	• *The Gopi Diaries* • *Wise and otherwise* • *Dollar Bahu* • *House of Cards* *The magic of the last temple* • *The Day I Stopped Drinking Milk*
Nirad C Chaudhari	• *The Autobiography of an Unknown Indian* • *A Passage to England*
Chetan Bhagat	• *Half Girlfriend* • *What Young India Wants* • *One Indian Girl* • *One Night at the Call Centre* • *400 Days* • *The Three Mistakes of My Life* • *Five Point Someone* • *Revolution 2020* • *2 States*
Arundhati Roy	• *The God of Small Things* • *Ministry of Utmost Happiness* • *An Ordinary Person's Guide to Empire* • *The End of Imagination* *War Talk* • *Field Notes on Democracy* • *Walking with the Comrades* • *Field Notes On Democracy* • *Capitalism* • *Broken Republic* • *Things that can & cannot be said*
Amitav Ghosh	• *Sea of Poppies* • *The Living Mountain* • *River of Smoke* • *The Hungry Tide* • *The Shadow Lines* • *Flood of fire* • *The Calcutta Chromosome* • *Gun Island* • *In an Antique Land*

AUTHOR	BOOK TITLE
Amitav Ghosh	• *The Glass Palace* • *The Great Derangement*
Amish Tripathi	• *Scion of Ikshvaku* • *The Immortals of Meluha* • *Secret of Nagas* • *The Oath of Vayuputras* • *Raavan* • *Sita-Warrior of Mithila*
Devdutt Pattanaik	• *Secrets of the Goddess* • *My Gita, Myth Mithya: A Handbook of Hindu Mythology* • *7 Secrets of Vishnu* • *SITA: An Illustrated Retelling of Ramayana* • *Secret of Shiva* • *Devlok* • *Decoding Hindu Mythology* • *My Hanuman Chalisa*
Aravind Adiga	• *Selection Day* • *The White Tiger* • *Last Man in Tower*
Vikas Swarup	• *Slumdog Millionaire*
Salman Rushdie	• *Midnight's Children, The Satanic Verses, Knife: Meditations After an Attempted Murder* • *Grimus: Roman* • *The Moor's Last Sigh* • *Joseph Anton: A Memoir*
Jhumpa Lahiri	• *Interpreter of Maladies* • *The Namesake* • *Unaccustomed Earth* • *The Lowland* • *In Other Words (Language: Italian)*
Ravi Subramaniam	• *If God was a Banker* • *In the Name of God* • *Bankster* • *The Incredible Banker* • *God is a Gamer*
Rohinton Mistry	• *A Fine Balance* • *Family Matters* • *Such a long Journey* • *Tales from Firozsha Baag*
Taslima Nasrin	• *Lajja*
Mala Sen	• *India's Bandit Queen: A True Story of Phoolan Devi*
Chitra Banerjee Divakaruni	• *The Palace of Illusions* • *The Forest of Enchantments* • *Before We Visit the Goddess* • *The Vine of Desire* • *The Forest of Enchantments* • *The Palace of Illusions* • *Mistress of Spices* • *Arranged Marriage*

AUTHOR	BOOK TITLE
Ruskin Bond	• *The Tiger in the Tunnel,* • *The Room on the Roof* • *The Blue Umbrella* • *Roads to Mussoorie* • *A Handful of Nuts* • *Angry River* • *Cherry Tree* • *A Flight of Pegions* • *Delhi is not far* • *Book of Humour* • *The Night Train at Deoli and other Stories*
Akshat Gupta	• *The Hidden Hindu*
Sitaram Yechury	• *Modi Government: New Surge of Communalism*
Roy Moxham	• *Outlaw: India's Bandit Queen and Me*
Shivaji Sawant	• *Mrityunjay*
Anna Chandy	• *Atmakatha*
Anita Desai	• *Fasting, Feasting, In Custody* • *Clear Light of Day (Booker Prize in 1980)* • *Where Shall We Go This Summer*
Sunjeev Sahota	• *The Year of the Runways*
Meghna Pant	• *Boys Don't Cry*
Anuradha Roy	• *Sleeping On Jupiter*
Shobhaa De	• *Sultry Days* • *Second Thoughts*
R. K. Laxman	• *The Tunnel of Time: An Autobiography* • *Timeless Laxman*
Satyajit Ray	• *Jakhan Choto Chilam* • *Childhood Days: A Memoir* • *The Householder* • *The Apu Trilogy (1955–1959)* • *The Music Room (1958)* • *The Big City (1963)* • *Charulata (1964)* • *The Goopy–Bagha trilogy (1969–1992)*
Indra Nooyi	• *My Life in Full: Work, Family, and Our Future*
Nandini Sengupta	• *The King Within*
Krishna Sobti	• *The Heart Has Its Reasons*
Jeet Thayil	• *Nacropolis* • *These errors are correct* • *Apocalyps*
Ahmed Ali	• *Twilight in Delhi*
Amrita Sher Gill	• *Three Girls*
Geetha Nagabhushana	• *Baduku*
Vaidehi	• *Krouncha Pakshigalu*
P. Sainath	• *Everybody Loves a Good Drought*

AUTHOR	BOOK TITLE
Ramchandra Guha	• *India after Gandhi* • *Gandhi Before India*
Arun Joshi	• *The Last Labyrinth*
Manohar Malgonkar	• *A Bend in the Ganges*
Jayshankar Prasad	• *Kamayani* • *Dhruvswamini* • *Kankal* • *Titli* • *Lahar* • *Aansoo*
Pranay Lal	• *Indica: A Deep Natural History of the Indian Subcontinent*
Sandip Jauhar	• *Heart: A History*
Mrinal Pande	• *Sahela Re*
Sanjeev Sanyal	• *The Ocean of Churn* • *Land of Seven Rivers* • *Revolutionaries*
Gurucharan Das	• *The Elephant Paradigm* • *India Unbound* • *The Difficulty of Being Good* • *A Fine Family*
Pavan K. Varma	• *Being Indian*
Sunil Gangopadhyaya	• *The Adventure of Kakababu*
Natasha Sharma	• *Bonkers*
Amitabh Bagchi	• *Unknown city* • *Above Average* • *The Household* • *This Place* • *Half the Night is Gone*
Nandini Chatterjee	• *Negotiating Mughal Law*
Rohit Sinha	• *School to Startup: Navigating the Path of Entrepreneurship*
Romila Thapar	• *Ashok and the decline of Maurya's* • *Somanatha* • *The Penguin History of India*
Norris Pritam	• *The Neeraj Chopra Story: The man who made History*
Amit Chaudhuri	• *Friend of My Youth*
Anita Nair	• *Hot Stage* • *Ladies Coupe* • *The Better Man*
Tharman Shanmugaratnam	• *India on Our Minds*
Kavitha Iyer	• *Landscapes of Loss: The Story of an Indian Drought*
Girisa Kubera & Vikrant Pande	• *The Tatas: How a Family Built a Business and a Nation*
Bhanu Mushtaq	• *Heart Lamp (Originally in Kannada)*

AUTHOR	BOOK TITLE
Ramdhari Singh Dinkar	• *Urvasi* • *Rashmirathi* • *Kurukshetra* • *Parshuram ki Pratiksha* • *Renuka*
Meghnad Desai	• *The Rediscovery of India* • *The Poverty of Political Economy* • *Who Wrote the Bhagavad Gita* • *The Raisina Model* • *Mayabharat* • *Divided by Democracy* • *Dead on Time* • *Marx's Revenge: The Resurgence of capitalism and the Death of Statist Socialism* • *Nehru's Hero: Dilip Kumar in the Life of India*
Anuja Chandramouli	• *Shakti: The Divine Feminine* • *Mohini: The Enchantress*
Gitanjali Shri	• *Tomb of Sand (Booker Prize 2022)*
Sudarshan Iyengar	• *In the footsteps of Mahatma Gandhi and Sanitation*
Ashwin Sanghi	• *The Vault of Vishnu*
Vinita Dawra Nangia	• *Reimagine Your Life* • *Love Is Always Right and Other Musings*
Manohar Malgorkar	• *The Devil's Wind*
Manu Joseph	• *Serious Men (Hindu Literary Prize)* • *The Illicit Happiness of Other People* • *Miss Laila, Armed and Dangerous*
Preeti Shenoy	• *When Love Came Calling* • *Life is what you make it* • *Wake Up, Life is calling* • *The Secret Wishlist* • *The Rule Breakers* • *A Place Called Home*
Priya Hajela	• *Ladies' Tailor*
Jaishree Mishra	• *Accidents Like Love & Marriage*
Kavita Kane	• *The Fisher Queen's Dynasty*
Aanchal Malhotra	• *Remnants of Separation*
Advait Kottary	• *Siddhartha: The Boy Who Became The Buddha*
Amartya Sen	• *The Idea of Justice* • *Poverty and Famines* • *Commodities and Capabilities* • *Development as Freedom (1998)*
Kamleshwar	• *Kitne Pakistan* • *Kaali Aandhi* • *Raja Nirbansiya*
D.G. Tendulkar	• *Gandhi in Champaran*

AUTHOR	BOOK TITLE
Rajmohan Gandhi	• *Fraternity: Constitutional Norm and Human Need*
Ravindra Kumar	• *Champaran to Quit India Movement*
B.B. Mishra	• *Mahatma Gandhi's Movement in Champaran*
Shankar Dayal Singh	• *Gandhi's First Movement: Champaran Movement*
S.K. Shukla	• *Gandhian Satyagraha and his Champaran Movement*
Mahadevi Verma	• *Gillu* • *Sansmaran* • *Nirja* • *Yama* • *Deepshikha*
Neelum Saran Gour	• *Requiem in Raga Janki*
Sandeep Sahu	• *Madam President: The Biography of Droupadi Murmu*
Indra Sinha	• *Animal's People (Related to Bhopal Gas Tragedy)*
Sanjaya Baru	• *The Accidental Prime Minister (About Manmohan Singh)*
Ambai	• *In A Forest, A Deer*
Kashi Nath Singh	• *Kashi Ka Assi*
Aribam Syam Sharma	• *Living Shadows*
Bhisham Sahni	• *Tamas* • *Hanoosh* • *Kahaniyan* • *Madhavi*
Phanishwar Nath Renu	• *Maila Anchal*
Siddharth Dhanvant Shanghvi	• *The Last Song of Dusk*
Avni Doshi	• *Burnt Sugar*
Jaishankar Prasad	• *Kamayani (Poem)*
Twinkle Khanna	• *Mrs Funnybones* • *Welcome to Paradise*
Anupam Kher	• *The Best Thing About You is You* • *Your Best Day is Today* • *Lessons Life Taught Me Unknowingly: An Autobiography*
Rishi Singh Gherwal	• *Kundalini: The Mother Of The Universe* • *The Mystery of Piercing The Six Chakras*
Nand Kishore Acharya	• *Chheelate Hue Apne Ko*
Paro Anand	• *Being Gandhi*
Shrilal Shukla	• *Raag Darbari*
Fakir Hassen	• *150 Years of Celebrating of Mahatma: The South African Legacy*
Nirupama Yadav	• *Vishesh: Code To Win*

AUTHOR	BOOK TITLE
Ram Chandra Guha	• *Democrats and Dissenters*
Jairam Ramesh	• *The Light of Asia: The Poem that Defined the Buddha*
Mukul Kesavan	• *Men in White: A Book Of Cricket*
G. Krishnan	• *The Hitman: The Rohit Sharma Story*
Prem Prakash	• *Reporting India: My Seventy-Year Journey As A Journalist (Memoir)*
Jugal Hansraj	• *Cross Connection: The Big Circus Adventure*
Rajendralala Mitra	• *Buddha Gaya: The Hermitage of Sakya Muni*
Sarbpreet Singh	• *Night of the Restless Spirits: Stories from 1984*
Shuja Nawaz	• *Crossed Swords: Pakistan, Its Army and The War Within*
Sunil Gangopadhyay	• *Those Days (Translated from the Bengali novel Sei Samay)*
N. Chandrasekaran	• *Bridgital Nation Solving Technology's People Problem*
Anand Neelakantan	• *Asura: Tale of the Vanquished* • *Many Ramayanas, Many Lessons*
K. Siva Reddy	• *Pakkaki Ottigilite (Poem)*
Mahasweta Devi	• *Hazara Chaurasi Ki Maa*
Ravish Kumar	• *The Free Voice: On Democracy Culture and The Nation*
Khalid Jawed	• *The Paradise of Food*
Andimuthu Raja	• *2G Saga Unfolds*
Tahira Kashyap Khurrana	• *The 7 Sins of Being a Mother*
R. C. Dutt	• *The Economic History of India*
Anuja Chauhan	• *The Zoya Factor*
Salim Ali	• *The Fall of a Sparrow*
Priyanka Chopra	• *Unfinished: A Memoir*
Vikram Chandra	• *Red Earth and Pouring Rain*
Indu Sundaresan	• *The Mountain of Light*
Ishtiaq Ahmed	• *Jinnah: His Successes, Failures and Role In History*
Subramanian Swamy	• *Reset: Regaining India's Economic Legacy*
Navin Chawla	• *Every Vote Counts: The Story of India's Elections*
Amrita Pritam	• *Pinjar* • *Rasidi Ticket* • *Kore Kagaz* • *Nagma*
Kailash Satyarthi	• *Every Child Matters*
Sushil Kumar	• *A Prime Minister To Remember Memories of A Military Chief.*

AUTHOR	BOOK TITLE
Nilima Chitgopekar	• *The Reluctant Family Man: Shivaji in everyday Family Life*
V. S. Naipaul	• *India: A Million Mutinies Now* • *Role in History* • *A Bend in the River* • *An Area of Darkness* • *A House for Mr. Biswas* • *Miguel Street* • *In a Free State* • *The Enigma of Arrival* • *The Mimic Men* • *Half a life* • *Guerrillas* • *India: A Million Mutinies Now*
Satya Nadella	• *Hit Refresh (Memoir)*
Meira Kumar	• *Indian Parliamentary Speaker's Perspective*
Kiran Desai	• *The Inheritance of Loss*
Kuldip Nayar	• *Beyond the Lines* • *Without fear: The Life and Trial of Bhagat Singh* • *The Judgement: Inside Story of the Emergency in India*
Venkat Raman Singh Shyam and S Anand	• *Finding My Way*
Emraan Hashmi	• *The Kiss of Life*
Mithali Raj	• *Unguarded (Autobiography)*
Nayantara Sahgal	• *Indira Gandhi: Tryst with Power* • *Rich like us* • *The Dog in Shadow*

BOOKS BY FOREIGN AUTHORS

AUTHOR	BOOK TITLE
Thomas Hardy	• *Tess of the d'Urbervilles*
F. Scott Fitzgerald	• *The Great Gatsby*
Gillian Flynn	• *Gone Girl*
Leo Tolstoy	• *Anna Karenina* • *My Confession* • *War and Peace* • *Resurrection*
E. M. Forster	• *A Passage to India*
Mo Yan	• *Blending Myth, politics and magical realism*
Kazuo Ishiguro	• *The Remains of the Day (Booker Prize In 1989)* • *Never Let Me Go* • *A Pale View of Hills*
Kazuo Ishiguro	• *Klara & The Sun* • *The Buried Giant* • *The Unconsoled* • *The English Patient*
Keri Hulme	• *The Bone People*
Chinua Achebe	• *Arrow of God*
Suzanne Collins	• *The Hunger Games*
Iris Murdoch	• *The Sea, The Sea*
Ian McEwan	• *Atonement* • *Amsterdam* • *Saturday* • *Nutshell* • *Machines Like Me* • *The Children Act* • *Enduring Love*
David Guterson	• *Snow Falling on Cedars*
Carlos Ruiz Zafon	• *The Shadow of the Wind*
Hilary Mantel	• *Wolf Hall*
Junot Diaz	• *The Brief Wondrous Life of Oscar Wao*
Khaled Hosseini	• *The Kite Runner*
John Burdet	• *The Godfather of Kathmandu*
Emily St. John Mandel	• *Sea of Tranquility*
Eric Morgenstern	• *The Night Circus*
Richard Powers	• *The Overstory*
Carl Schmitt	• *The Concept of Political*
Chimamanda Ngozi Adichie	• *Half of a Yellow Sun*
Laszlo Krasznahorkai	• *Spadework for a Place*
David Szalay	• *Flesh (Booker Prize 2025)*
David Galgut	• *The Promise (Booker Prize 2024)*
Barbara Kingsolver	• *Demon Copperhead*
Sherman Alexie	• *The Absolutely True Diary of a Part-Time Indian*
Gabriel Garcia Marquez	• *One Hundred Years of Solitude*
Peter Frankopan	• *The Silk Roads: A New History of the World*
Nadine Gordimer	• *The Conservationist*
NoViolet Bulawayo (Indian Origin Author)	• *We Need New Names*
Claire Keegan	• *Small Things Like These*
Shehan Karunatilaka	• *The 7 moons of Almeida*
Alice Munro	• *Master of the Contemporary Short Story (Nobel Prize in 2013)*
Ernest Hemingway	• *Across the River and into the Trees* • *The Old Man and the Sea* • *Islands in the Sea*

AUTHOR	BOOK TITLE
Lewis Carroll	• *Alice's Adventures in Wonderland*
Jane Austen	• *Pride and Prejudice* • *Sense and Sensibility* • *Mansfield Park* • *Emma*
Mark Twain	• *The Adventures of Huckleberry Finn* • *The Gilded Age: A Tale of Today*
Harper Lee	• *To Kill a Mockingbird*
Ernst Hemingway	• *A Movable Feast*
Arthur C. Clarke	• *2001: A Space Odyssey*
Margaret Atwood	• *The Testaments* • *The Handmaid's Tale* • *Oryx and Crake* • *Aliase Grace* • *The Blind Assassin*
Bernardine Evaristo	• *Girl, Women, Other*
J.K. Rowling	• *The Tales of Beedle the Bard* • *Harry Potter and Prisoner of Azkaban*
Kenzaburo Oe	• *The Silent Cry*
Haruki Murakami	• *A Wild Sheep Chase* • *What I Talk About When I Talk About Running*
George Bernard Shaw	• *Caesar and Cleopatra*
Anna Sewell	• *Black Beauty*
David A. Vise	• *The Google Story*
John Hicks	• *Capital and Growth*
John Maynard Keynes	• *The General Theory of Employment, Interest and Money*
Maya Angelou	• *I Know Why the Caged Bird Sings*
Stephen King	• *On Writing: A Memoir of the Craft*
George Orwell	• *Animal Farm*
J. T. Owens	• *Elon Musk: The Unauthorised Autobiography*
Viktor Frankl	• *Man's Search For Meaning*
Rudyard Kipling	• *The Jungle Book* • *The Man Who Would Be King* • *Rikki-Tikki-Tavi*
Etaf Rum	• *A Woman Is No Man: A Novel*
Roald Dahl	• *Charlie And The Chocolate Factory* • *Boy: Tales of Childhood*
William Dalrymple	• *The Anarchy: The Relentless Rise of East India Company* • *The Last Mughal: The Fall of a Dynasty, Delhi 1857* • *White Mughals* • *The Golden Road* • *The Anarchy: The East India Company, Corporate Violence, and the Pillage of an Empire*
Jay Shetty	• *Think Like A Monk*
Wendell Rodricks	• *Poskem: Goans in the Shadows*
Malala Yousafzai	• *We Are Displaced*
Marie Louise Burke	• *Swami Vivekanand in the West: New Discoveries*
Adam Smith	• *The Inquiry of Nature and the Causes of the Wealth of Nations* • *The Theory of Moral Sentiments*
Andy Marino	• *Narendra Modi: A Political Biography*

BOOKS BY MUSIC AND FILM PERSONALITIES

AUTHOR	BOOK TITLE
Sonu Sood	• *I Am No Messiah*
James Brown	• *The Godfather of Soul*
Karan Johar	• *Unsuitable Boy*
Rishi Kapoor	• *Khullam Khulla*
Shatrughan Sinha	• *Anything But Khamosh*
Ayushmann Khurrana	• *Cracking the Code: My Journey to Bollywood*
Dev Anand	• *Romancing with Life*
Johnny Marr	• *Set The Boy Free*
Michael Jackson	• *Moonwalk*
Shantaram	• *George David Robert*
Pt. Ravi Shankar	• *Raga Mala*
Shiv Kumar Sharma	• *Journey with a Hundred Strings: My life in Music*
Ramakrishnabuwa Vaze	• *Sangeet Kala Prakash*
Balraj Sahni	• *Meri Filmy Atmakatha*

OTHER NOTABLE AUTOBIOGRAPHIES

AUTHOR	BOOK TITLE
BV Acharya	• *All From Memory: An Autobiography*
Teju Behun	• *Drawing From the City*
Kamala Das	• *My Story*
Amrita Pritam	• *Revenue Stamp: An Autobiography*
Shantabai Krushnaji Kumble	• *Majya Jalmachi Chittarkatha*
Karan Thapar	• *Devil's Advocate: The Untold Story*
Banarasi Das Jain	• *Ardhakathanaka (The Half Story)*
Baba Ramdev	• *My Life, My Mission*
Prem Chopra	• *Prem Naam Hai Mera, Prem Chopra*
Kareena Kapoor	• *The Style Diary of a Bollywood Diva*

OLYMPICS

History of Olympics

- *Governing body:* International Olympic Committee (IOC) → Conducts Olympics.
- *Headquarters:* Initially in Paris, France → Currently in Lausanne, Switzerland.
- *Founded in:* 1894 by Pierre de Coubertin (2nd President of IOC) and Demetrius Vikelas (1st President of IOC).
- *Current President of IOC:* Kirsty Coventry.
- *Official motto:* "Citius, Altius, Fortius - Communiter" (Faster, Higher, Stronger Together).
- *Symbol:* Olympic Rings (Blue, Yellow, Black, Green, Red) representing the unity of the five continents.
- *Total member countries:* 206.
- *Selection of host cities:* They are chosen through a Secret Ballot.

The first Winter Paralympics Games held in Sweden in 1976.

Olympic Games Timeline

- *First Summer Olympics:* 1896 (Athens, Greece).
- *First Winter Olympics:* 1924 (Chamonix, France).
- *First Paralympics:* 1960 (Rome, Italy).
- *First Youth Summer Olympics:* 2010 (Singapore).
- *First Youth Winter Olympics:* 2012 (Innsbruck, Austria).
- *Second Olympic Games:* 1900 (Paris, France)→ First women participation was seen here.

2 years gap between Summerand Winter Olympics.

Upcoming Olympics Events

- 2026 Winter Olympics: Milan and Cortina (Italy).
- 2028 Summer Olympics: Los Angeles, California, USA.
- 2030 Winter Olympics: French Alps (France).
- 2032 Summer Olympics: Brisbane (Australia).
- 2034 Winter Olympics: Salt Lake City (USA).

Hosting Cities

- *Most number of times hosted by:* USA *(8 times → 4 Summer and 4 Winter Olympics).*
- *London:* 3 *times.*
- *Paris:* 3 *times.*
- *Los Angeles:* 3 *times.*

INDIA'S PERFORMANCE IN OLYMPICS

- *1900:* First participation of India in Paris, France.
- *First Indian medalist:* Norman Pritchard (Anglo-Indians) → won 2 *silver* medals in 1900.
- *1920:* India's first-ever Olympic contingent, a *six-member team* participated in Belgium Olympics → *First flag bearer:* Purma Banerjee.
- *Total medals won by India:* 41 *medals.*
- 10 *Gold medals (8 medals won by Indian Hockey Team and 2 individual medals won) + 10 Silver + 21 Bronze.*

In Hockey

- The Indian Men's Hockey team is the most successful team in Olympics with a record of winning 8 *gold + 1 silver + 4 bronze* till now.

Participation of Indian Men's Hockey Team

- *1916:* No Olympics held due to **World War I (1914-1918).**
- *1928:* Amsterdam Olympics→ Captain of Indian Men's Hockey Team: *Jaipal Singh Munda. 14 goals* scored by *Major Dhyanchand* (he is considered as *"Wizard of Hockey"*).
- *1932:* Los Angeles Olympics → Won from *US* by *24-1.*
- *1936:* Berlin Olympics (Capital: Dhyanchand).
- *1940-1944:* No Olympics due to **World War II (1939-1945).**
- **1948:** London Olympics → Men's Hockey team was led by *Kishan Lal.*
- *1952:* Helsinki Olympics → *Balbir Singh Sr.* scored 5 *goals* (he is the first sportsperson to receive Padma Shri award).
- *1956:* Melbourne Olympics → 6*th* gold medal won.
- *1960:* Rome Olympics → A *silver* medal won.
- *1964:* Tokyo Olympics 7*th* gold medal won by defeating *Pakistan.*

  India also won 2 *Bronze medals* in:
- *1968:* Mexico Olympics → *bronze* medal won.
- *1972:* Munich Olympics → *bronze* medal won.
- *1976:* Montreal Olympics → India went home with no medal.
- *1980:* Moscow Olympics → 8*th* gold medal won.

Individual Gold Medals Won by India in Olympics

- *2008: Beijing Olympics* → *Abhinav Bindra* in 10 m Air Riffle *Shooting.*
- *2020: Tokyo Olympics* → *Neeraj Chopra* was the first Indian to win gold in *Track and Field* (record: 87.58 m) on 7th August (this day is now celebrated as *"National Javelin Day"*).

The first Winter Paralympics Games held in Sweden in 1976.

Some Notable Olympic Medalists of India

- *1952:* Helsinki Olympics →First individual bronze medal won by *K.D. Jadhav* in *Wrestling.*

- *1996:* Atlanta Olympics → *Leander Paes* won *bronze* medal in *Tennis*.
- *2000:* Sydney Olympics → *Karnam Malleswari* became the first woman to win medal *(bronze)* in Olympics in weightlifting.
- *2004:* Athens Olympics → *Silver* medal won by *Rajyavardhan Singh Rathore* in shooting (1st Indian to win medal in shooting).
- *2008:* Beijing Olympics → *Vijendra Singh* won *bronze* medal in boxing and *Sushil Kumar* won *bronze* medal in *wrestling*.

Beijing is the first city to host both Summer and Winter Olympics editions.

2012 London Olympics

- *Sushil Kumar:* He won a *silver* in wrestling.
- *Vijay Kumar:* He won a *silver* in shooting.
- *Saina Nehwal:* She won a *bronze* medal and is also the first Indian to win a medal in *Badminton*.
- *Mary Kom:* She won a *silver* medal and is also the first Indian woman to win a medal in *Boxing*.
- *Yogeshwar Dutt:* He won a *bronze* medal in *wrestling*.
- *Gagan Narang:* He won a *bronze* medal in *10m air riffle shooting* event.

2016 Rio Olympics

- *PV Sindhu:* She won a *silver* medal in Badminton.
- *Sakshi Malik:* She won a *bronze* medal in wrestling.

2020 Tokyo Olympics

- The phrase *"we have wings"* is associated with the opening ceremony of the Tokyo 2020 Paralympic Games.
- *Official mascot of 2020 Tokyo Paralympics: Someity.*
- *India's rank in Tokyo Olympics 2020: 48th.*
- *Mirabai Chanu:* She won a *silver* medal in *weightlifting*.
- *Lovlina Borgohain:* She won a bronze medal in *boxing*.
- *PV Sindhu:* She won a *bronze* medal in *badminton*. She has the honour of being a *"double medallist"* at the Olympics.
- *Bajrang Punia:* He won *bronze* medal in *wrestling*.
- *Neeraj Chopra:* He won a *gold* medal in *javelin throw*.
- *Men's Hockey Team:* They won a *bronze* medal.

Someity is related to: Tokyo Paralympics 2020.

2024 Paris Olympics

- *Torch bearer: Abhinav Bindra.*
- *Flag bearerfor opening ceremony: Achanta Sharath Kamal* (table tennis player) and *PV Sindhu*.
- *Flag bearer for closing ceremony: PR Sreejesh* and *Manu Bhaker*.
- *Chef de Mission: Gagan Narang.*
- *Bilquis Mir:* She is the first Indian women to be *jury member* in Olympics.

Medals Tally of India in 2024 Paris Olympics

- India sent a contingent of *117 athletes* to the Paris 2024 Olympics.
- In all event, India won *6 medals* → *a silver* and *5 bronze medals*.
- *India's rank: 71* out of 206 Nations.

Athlete	*Event*	*Sport*	*Medal*
Manu Bhaker	Women's 10m air pistol	Shooting	Bronze
Manu Bhaker & Sarabjot Singh	Mixed team 10m air pistol	Shooting	Bronze
Swapnil Kusale	Men's 50m riffle 3 positions	Shooting	Bronze
Team India	Men's event	Hockey	Bronze
Neeraj Chopra	Men's javelin throw	Athletics	Silver
Aman Sehrawat	Men's freestyle 57kg	Wrestling	Bronze

About Manu Bhaker

- She is the *first Indian woman* to win a Olympic shooting medal.
- She is also the first Indian woman to *win multiple medals* in a single edition of the Olympics, after she won a *bronze* medal in mixed team *10m pistol event* with *Sarabjot Singh*.

Medals Tally of India in 2024 Paris Paralympics Olympics

- First Paralympics held in: 1960 in Rome, Italy.
- Total medals won in 2024: 7 gold, 9 silver, and 13 bronze.

Total medals: 29

Gold Medals Won by Athletes Paralympics

Athlete	*Event*	*Sport*	*Medal*
Avani Lekhara	Women's 10m air riffle standing SH1	Shooting	Gold
Nitesh Kumar	Men's single SL3	Badminton	Gold
Sumit Antil	Javelin throw F64	Athletics	Gold
Harvinder Singh	Men's individual recurve open	Archery	Gold
Dharambir	Men's club throw F51	Athletics	Gold
Praveen Kumar	Men's high jump T64	Athletics	Gold
Navdeep Singh	Men's javelin throw F41	Athletics	Gold

INDIAN OLYMPIC ASSOCIATION (IOA)

- *Established:* 1927.
- *First President:* Dorabji Tata (1927).
- *Second President:* Maharaja Bhupindra Singh (1928).
- *Current President:* P.T. Usha (she is also known as "Payyoli Express").

P.T. Usha Records in

- Asian Games in 1982, Delhi and 1986, Seoul.
- In 1984 Olympics, she lost bronze medal by 0.01 seconds.

Some Facts on Olympics

- Michael Phelps is the most decorated olympian of USA to win 28 medals (23 golds) in Olympics.
- Cricket to be included in 2028 Los Angeles Olympics along with other sports → Football, Squash, Baseball, Softball, Lacrosse.
- Satish Kumar is the first Indian to participate in a Super Heavyweight Boxing event in the 2020 Olympic Games.
- Archery event was hosted at Lord's Cricket Ground (LCG) at the 2012 Olympics.
- Thomas Hicks was the first American male athlete to win the Marathon gold medal in the Olympic Games.
- Marathon Distance: The official length is 42.195 km.
- South Africa has never hosted Olympics.
- In 1992, Shiny Wilson became the first woman to carry India's flag at the opening ceremony of the Summer Olympic Games.
- Shabana Akhtar became the first female athlete to represent Pakistan in 1996 Atlanta Olympics.
- The major component of modern Olympic gold medals is silver, with a minimum of 92.5% silver, and then plated with a minimum of 6 grams of pure gold.

COMMONWEALTH GAMES

- *First held in:* 1930, Hamilton, Canada.
- *Not held in:* 1942 and 1946 (due to WWII).
- *Previously called as:* British Empire Games (1930-1950).
- *Current Head:* King Charles III.
- *Most hosted by:* Australia (5 times)
- *India hosted in:* 2010 (New Delhi) → India finished in 2nd place.
- 2022 Birmingham CWG: India finished 4th.
- 2026: Glasgow (Scotland) to host for the 4th time.
- *Commonwealth ratification:* May 1949.
- *Commonwealth Nations:* 56 countries (India, Australia, Canada, South Africa, Britain, etc.).

ASIAN GAMES

- Asian Games are also known as Asiad.
- It is a quadrennial multi-sport event for athletes from Asia.
- *Organized by:* Olympic Council of Asia.
- *First Asian Games held at:* 1951, New Delhi, India.
- India also hosted Asian Games in 1982.
- *Most hosted by:* Thailand (4 times) and South Korea (3 times).

Upcoming Asian Games

- 2022: Hangzhou, China.
- 2026: Nagoya, Japan.
- 2030: Doha, Qatar.

Some Facts on Asian Games

- Neeraj Chopra first set the senior national record during the 2016 South Asian Games held at Guwahati.
- India won 5 gold medals in 1986 Asian Games held in Seoul, South Korea.

CRICKET

- *Governing body (international cricket):* International Cricket Council (ICC). ICC was established as Imperial Cricket Conference in 1909 and became ICC in 1989.
- *Headquarters:* Dubai, UAE.
- *Governing body (Indian Cricket):* Board of Control for Cricket in India (BCCI).
- *Headquarters:* Mumbai.
- *First Test Match:* 1877 (Australia vs England, in England).
- *First ODI Match:* 1971 {Australia vs England, Melbourne Cricket Ground (MCG)}

Sports Authority of India (SAI) was setup in 1984.

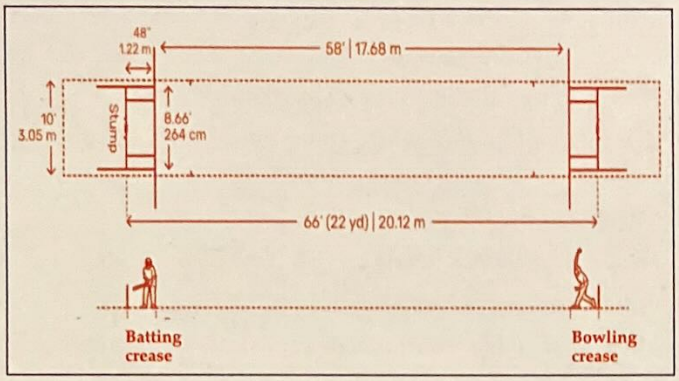
Cricket World Cup

- *First cricket World Cup:* Women (1973, in England) and Men (1975, in England → Winner: West Indies).
- *India has won World Cup two times:* 1983 (under Kapil Dev's captaincy) by defeating West Indies and in 2011 (under MS Dhoni's captaincy) by defeating Sri Lanka.
- *2023 World Cup (held in India):* Won by Australia (6th title) by defeating India. Australia holds the record for the most ICC Men's Cricket World Cup titles.

Nick names of MS Dhoni: "Captain cool"; "Thala"; "Mahi".

ICC Men's Cricket World Cups Hosted by India

- 1987: India and Pakistan jointly hosted.
- 1996: India, Sri Lanka and Pakistan jointly hosted.



- *2011:* India, Sri Lanka, and Bangladesh jointly hosted (*"Stumpy"* the elephant was its official mascot)
- *2023:* India.
- *2032:* India (upcoming).

***2027 World Cup: Will be hosted by South Africa, Zimbabwe, Namibia.**

T20 Cricket World Cup

- ***First Edition:*** *2007* (held in South Africa and won by *India*).
- ***Most titles:*** *England, West Indies and India (2 each).*
- ***2022:*** Held in Australia and won by England
- ***India has won two times:*** In *2007* and *2024*.
- ***2024 hosts:*** *USA* and *West Indies* (*India won* by defeating *South Africa*).
- ***2026 hosts:*** *India* and *Sri Lanka* (*India won* by defeating *New Zealand*).
- ***Upcoming:*** *2028* (Will be hosted by *Australia* and *New Zealand*).

Champions Trophy

- ***Inaugurated in:*** *1998 (Host Bangladesh), Winner: South Africa.*
- ***Current Champion:*** *India (2025).*
- ***Most successful teams:*** *India* (3rd title) and *Australia* (2nd title).

Asia Cup

- ***1st held in:*** *1984 (Sharjah, UAE).*
- ***Most won by:*** *India* (8 times).
- ***Current Champion:*** *India*.

Dimensions

- Cricket field shape: It is generally *oval* or *circular*.
- Weight of cricket ball: *156-163 g*.
- Cricket pitch length: *22 yards*. The distance between the stumps and the popping crease at the same end of a cricket pitch is *1.22 m*.
- Wicket (Stump) height: *28 inches*.
- In One Day Internationals (ODIS), a bowler can bowl a maximum of *10 overs*, while in T20 matches, the maximum is *4 overs*.
- Ball change is allowed to only after *80 overs in test cricket*.
- Strike rate calculation: $\frac{\textbf{Total runs scored}}{\textbf{Total balls faced}} \times 100$
- In a test match cricket, a team can play a minimum of *90 overs* in a day.
- Over rate in Test match is *15 overs* per hour and ODI match is of *50 overs* and *3.5 hrs*.

Terms Associated

- *"Strike rate"* best describes the average number of runs a batter makes per *100 deliveries* in cricket.
- In cricket, if the umpire raises an index finger above the head it means: *Batsman is out*.
- In Cricket, if the umpire extends both hands horizontally it means: *Wide ball.*
- The first slip fielding position is behind the batsman.
- The term *"Chinaman"* in cricket refers to leg-spin delivery by a left-arm bowler.

Associated Trophies

- *Duleep Trophy; Ranji Trophy; ICC World Cups; ICC Champions Trophy; Asia Cup, Vijay Hazare trophy & Syed Mushtaq Ali Trophy*

Facts Associated with Cricket

- India's ODI debut was in *1971* against *England*.
- The *Maharaja of Vizianagaram* was the first Indian cricketer to serve as President of the Board of Control for Cricket in India (BCCI).
- The average circumference of the standard cricket ball in international cricket is: *8.81 inches-9 inches.*
- *Sachin Tendulkar* scored his first ODI century in his *79th* match. He has also featured in most no. of international cricket matches.
- *Lala Amarnath* was the first Test cricket captain of an independent Indian team.
- *Narendra Modi Cricket Stadium* is the largest cricket stadium in the world located at *Ahmedabad (India)*.

FOOTBALL (also known as SOCCER)

- ***Governing Body:*** *Fédération Internationale de Football Association (FIFA).*
- ***Headquarters:*** *Zurich, Switzerland.*

Football World Cup started in 1930.

- ***First FIFA Match:*** *1872* (England vs Scotland).
- ***First FIFA World Cup:*** *1930* held at *Uruguay* (winner: Uruguay).

- *Most Wins:* Brazil (5 times).
- *2022 Winner:* Argentina (held at Qatar).

Upcoming FIFA World Cups

- *2026 Hosts:* Canada, Mexico and USA.
- *2030 Hosts:* Morocco, Portugal, and Spain.

- **Indian Football Association was established in 1893.**
- **Football leagues in India: Indian Super League (ISL) and 1st Edition was won by Atletico de Kolkata**

Ball

- Circumference of the ball: 68-70 cm.
- Weight of the ball: 410-460 gm.

About the Game

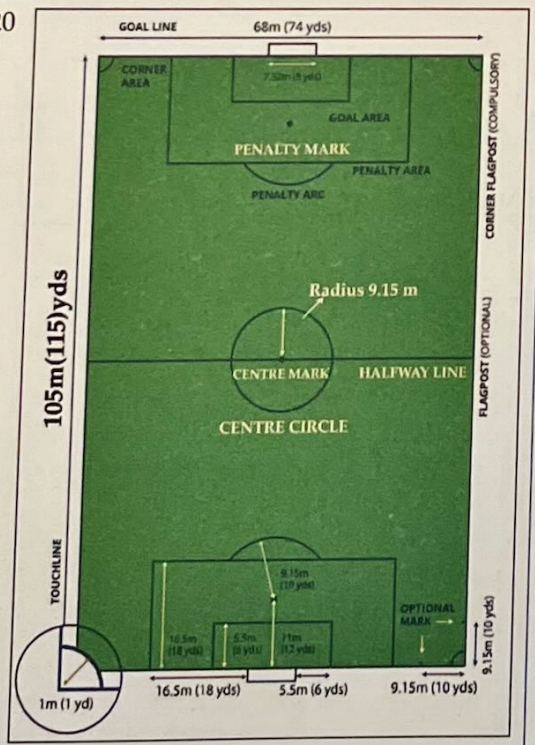
- *Minimum players to start a game:* 7.
- *Total no. of players in each team:* 11.
- *Game Duration:* 90 minutes (divided into two 45 mins halves).
- *Tie Breaker:* 30 minutes (penalty shootout if needed).
- *Substitutes allowed:* 3.

Famous Football Players

- *India:* Sunil Chhetri, Bhaichung Bhutia, P.K. Banerjee.
- *World:* Cristiano Ronaldo (Portuguese footballer); Lionel Messi (Argentine footballer); Neymar Jr (Brazilian footballer); Aitana Bonmati (Spain footballer).

Field Dimensions

- *Length:* 91-120 m (Standard: 105 m).
- *Width:* 45-91 m (Standard: 68 m).
- *Goal post:* Width: 24 ft (7.32 m) and Height: 8 ft (2.44 m).
- *Distance between goal posts:* 7.32 m (24 ft).
- Distance between penalty mark from midpoint of the goal post is: 11 m.



Cards in Football

- *Yellow card:* Foul and misconduct (caution to the player).
- *Red card:* Serious misconduct (player's dismissal from field).

Terms Associated:

Dribble (it is also used in hockey and basketball); Banana Kick, Bicycle Kick.

Trophies Associated

- *India:* Durand Cup (founded in 1888 in Shimla and is the oldest football tournament in India), Santosh Trophy, Rovers Cup (started in 1891).
- *World:* Merdeka Cup, Scissors Cup, La Liga.
- In football, when the ball strikes the frame of the goal or the referee and remains within the goal and touch lines, it is still in play.

Facts Associated with Football

- Sunil Chhetri is the second Indian footballer to play 100 international games after Bhaichung Bhutia.
- Mohammed Salim was the first player from the Indian subcontinent to play for a European Football club (Celtic FC).
- Manisha Kalyan is the first Indian female football player to play in Union of European Football Association (UEFA)'s women's champions league.
- The Super Bowl, an annual championship game of Football, is held in USA.

HOCKEY

Field Dimensions

- Length: 91.44 m
- Width: 55 m
- Astroturf is a synthetic surface, where Hockey is played.

Goalpost Size

- Height: 2.14 m
- Width: 3.66 m

Terms Associated:

Dribble; Scoop; Backstick; 16-yard hit.

About the Game

- Ball Weight: 156-163 gm
- *Number of Players:* 11.
- *Substitutes allowed:* No limit.
- *Game Duration:* 60 minutes (divided into 15 mins quarter). Earlier, the game was of 70 mins format with two 30 mins halves.

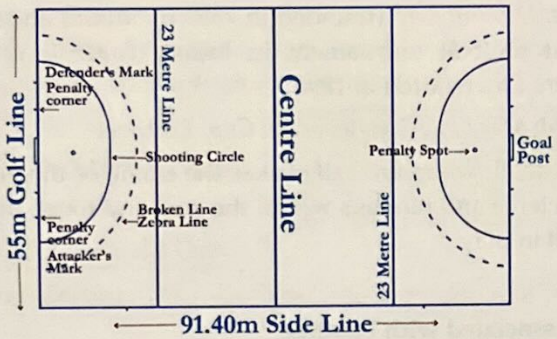
Cards in Hockey

- *Green Card:* Time penalty of 5 minutes.

- *Yellow Card:* Time penalty of 10 minutes.
- *Red Card:* Permanent expulsion from the game.

Hockey World Cup.

- *First World Cup:* 1971 (Winner: Pakistan).
- *Most titles won by:* Pakistan (4 times).
- India won it once (1975) → hosted hockey 4 times (most no. of times)



FIH Hockey5s World Cup.

- *First Edition held at:* 2024, Muscat, Oman.
- *Winners:* Netherlands (Men & Women).

Associated Trophies

- *Nehru Trophy; Wellington Trophy; Aga Khan Cup; Maharaja Ranjit Singh Cup; Rangaswamy Cup; Sultan Azlan Shah Cup* (hosted in Malaysia); *Sultan of Johor Cup* (hosted in Malaysia); *Begum Rasul Trophy; Murugappa Gold Cup; Beighton Cup* (oldest Hockey tournament in India established in 1895).

Facts Associated with Hockey

- In the game of *ice hockey*, during normal play *6 players* are there in each team on the ice at any one time to compete.
- In hockey, long corner is awarded if the ball goes over the back line after last being touched by a defender.
- *Major Dhyan Chand* is known as *"Wizard of Hockey"*.
- *Rani Rampal* is the *first woman* Hockey player to receive the *Rajiv Gandhi Khel Ratna Award*.
- *P. R. Sreejesh* was awarded *"Major Dyan Chand Khel Ratna Award"* in 2021.
- The *Birsa Munda International Hockey Stadium*, the largest Hockey stadium in the country, is situated in *Rourkela, Odisha*.

TENNIS

Field Dimensions

- *Length:* 78 ft (23.77 m).
- *Height:* 27 feet (8.23 m) for singles and 36 feet (10.97 m) for doubles.
- *Net height:* 3 feet (0.914 m) in the center and 3 feet 6 inches (1.07 m) at the posts.

Tennis Grand Slam Tournaments

Tournament	*Played In*	*First Played On*	*Type of Court*
Wimbledon	July	1877	Grass
US Open	Aug-Sep	1881	Hard court
French Open	May-June	1891	Clay court
Australian Open	January	1905	Hard court

Famous Players

- Roger Federer (lawn tennis): Switzerland
- Rafael Nadal: Spain
- Leander Paes, Sania Mirza, Mahesh Bhupathi, Rohan Bopanna, Vijay Amritraj, and Anand Amritraj.
- Tennis was first introduced in the Olympics in 1896.

The French Open also known as Roland-Garros.

Terms Associated: Deuce (equality in points → 40-40); Advantage Out (score when the receiver wins the next point after deuce), Love (a score of zero).

Associated Trophies: Davis Cup.

In Tennis, 6-4 score is a complete set.

Facts Associated with Tennis

- *Leander Paes* and *Mahesh Bhupathi* became the first two Indians as a pair to reach the finals of all Grand Slams in a year in the Open era, winning the French Open and Wimbledon as top seeds.

Leander Paes is the first Indian and Asian tennis player to win an Olympic medal.

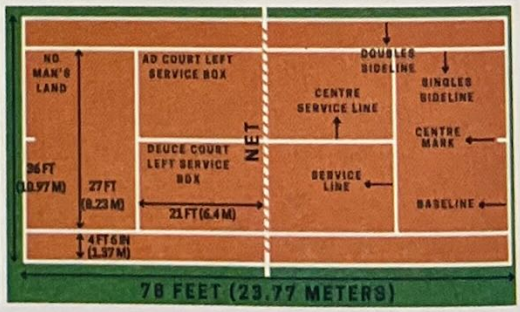


TABLE TENNIS

- Table Tennis is also known as *"Ping Pong"*.

Dimensions

- Table: 9 feet (2.74 m) long x 5 feet (1.525 m) wide and 2.5 feet (76 cm) high.
- Net height: 15.25 cm.

Tournaments

- *World Table Tennis Championships.*
- *ITTF World Cup.*
- *Olympic Games.*
- *Asian Games.*

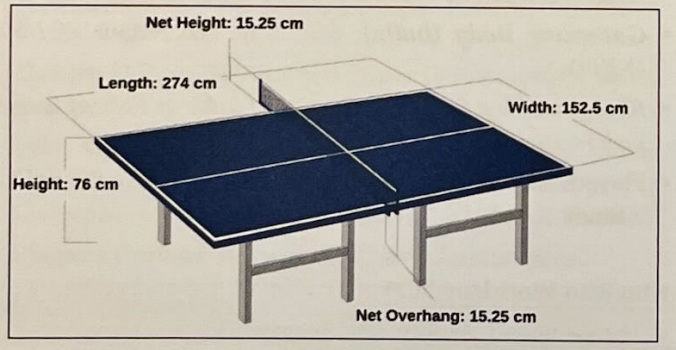
Ball Specifications

- ***Diameter:*** 40 mm.
- ***Weight:*** 2.7 g.
- ***Color:*** White or orange (with matte finish).

Associated Trophies: Corbillon Cup

Famous Players

- Achanta Sharath Kamal (Veteran, Arjuna Awardee).
- Manika Batra (India's top-ranked female TT player). She also won bronze medal in the Asian Cup tournament.
- Sathiyan Gnanasekaran.
- Sreeja Akula.



Facts Associated with Table Tennis

- In table tennis, the period during which a ball is in play is called *Rally*.
- In Table Tennis, unlimited lets are allowed in a row on a serve.
- Shake hand grip is used in Table Tennis.
- The first edition of the *World Para Table Tennis Championships* held in *Assen, Netherlands* (1990).

BADMINTON

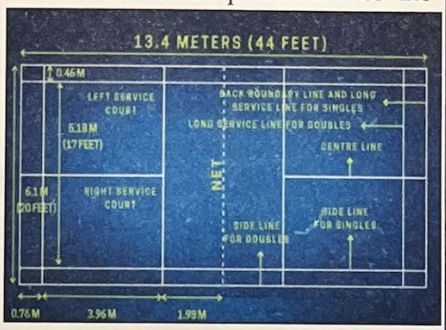
- ***Governed by:*** *Badminton World Federation (BWF).*
- It was initially known as *"Poona"*.

Court Dimensions

- ***Length:*** 44 ft (13.40 m)
- ***Width:*** 20 ft (6.10 m)
- ***Net height:*** 5 ft in middle and 5 ft 1 inch at the edges of the court.

Badminton was introduced in Olympics in 1992.

- ***Shuttlecock weight:*** 4.74-5.50 g
- ***Game format:*** Matches are played in the best of 3 games, with eachgame going up to 21 points. In case of deuce, a player must win by at least 2 points, unless the score reaches 29-29, in which case the next point decides the winner.



Cards in Badminton

- ***Yellow Card:*** Official warning.
- ***Red Card:*** Fault (opponent is awarded a point).
- ***Black Card:*** Disqualification (for severe misconduct).

Associated Tournaments

- *Thomas Cup (China):* Men's international team championship (1st Edition: 1949), *Uber Cup (China):* Women's international team championship.
- *Syed Modi International Badminton Championships (India), Narang Cup, Maharaja Ranjit Singh Gold Cup, Lady Ratan Tata Trophy, Yonex Cup*
- India has won Thomas Cup only once *(2022)*.

Facts Associated with Badminton

- *Saina Nehwal* won the *first badminton medal* in the Olympics games from India in *2012 London Olympics*.
- India will organise the *World Badminton Championship* event *2026*.
- The *Pullela Gopichand Badminton Academy* founded in *Hyderabad* (2008).
- *K. Srikanth* is associated with Badminton.

BALL BADMINTON

- Ball Badminton is a racket sport played with a *yellow ball*.
- ***Origin:*** Tamil Nadu, India.

BASKETBALL

- ***Basketball (India) governed by:*** *Basketball Federation of India (BFI).*

Terms Associated: Dribble; Pivot; Double dribble

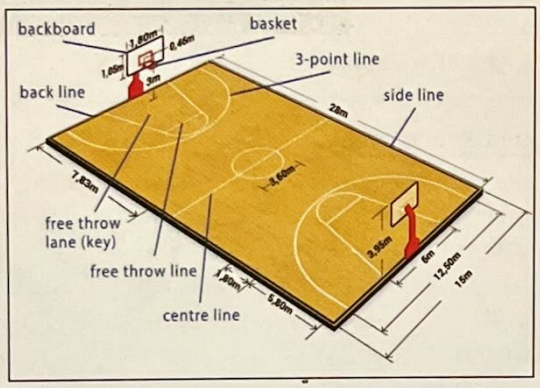
Court Dimensions

- ***Shape:*** Rectangle
- ***Length:*** 94 feet long (28.65 m).
- ***Height:*** 50 ft wide (15.24 m).

- ***Weight of the ball:*** Between 20 and 22 ounces (567 and 624 g).
- ***Total players:*** Each team has *5 players* (a total of 10 players on the court).

Facts Associated with Basketball

- In Basketball, the maximum number of points that can be scored in a shot is: *4*.
- A free throw in the games is worth *1 point*.
- The Basketball centre line is part of the Back court.
- A *FIBA* sanctioned game of basketball typically consists of *4 quarters* of *10 minutes* each.

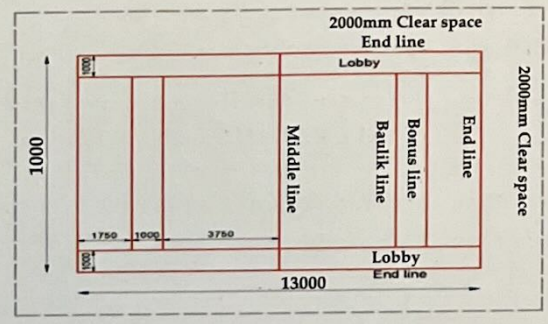


KABADDI

- ***Team size:*** *7 players* on court (up to 5 substitutes)

Match Duration

- Men: 2 halves x 20 minutes (with 5-minute break)
- Women & Juniors: Same duration



Court Dimensions (Standard Kabaddi)

- ***Men's Court:*** 13 m × 10 m
- ***Women's Court:*** 12 m × 8 m

Cards in Kabaddi

- ***Green Card:*** Warning.
- ***Yellow Card:*** 2-minute suspension.
- ***Red Card:*** Player is out of the match.

Terms Associated

- Raider; defender; raid; tackle; all-out; bonus; attack line, lona, bauk line.

Associated Tournaments

- *Pro Kabaddi League (PKL):* Franchise-based Indian league.
- *Kabaddi World Cup:* Organized by International Kabaddi Federation (IKF).
- *Asian Games Kabaddi:* Introduced in 1990.
- *South Asian Games.*
- *Senior National Kabaddi Championship:* Held annually in India.

Facts Associated with Kabaddi

- The first winner of the *Arjuna Award* in Kabaddi is *Sahanand Mahadev Shetty*.
- The *Pro Kabaddi League* founded in *India* in the year *2014* (*Jaipur Pink Panthers* won the first season).

KHO KHO

- ***Origin:*** India.
- ***Governing Body (India):*** *Kho Kho Federation of India (KKFI).*
- ***Recognized by:*** *Sports Authority of India & School Games Federation.*
- Played between two teams of *12 players* (9 take the field at a time).

Kho Kho Worldcup 2025

- ***Theme:*** Speed, Agility, and Teamwork
- ***Mascot:*** Tejas and Tara

Terms Associated: Inning.

BILLIARDS

- Ball weight: 160-170 g.
- ***Famous players:*** *Pankaj Advani, Sourav Kothari.*

CHESS

- ***Governing body:*** *FIDE - Fédération Internationale des Échecs (World Chess Federation).*
- Established in: *1924*.
- ***Headquarters:*** *Lausanne, Switzerland*.
- ***Governing body (India):*** *All India Chess Federation (AICF).*
- ***Headquarters:*** *New Delhi*.

Basic Setup

- ***Board Size:*** 8 × 8 grid = *64 squares* (alternating black and white)
- Each player starts with 16 pieces:
- ***1 King:*** Moves one square in any direction.
- ***1 Queen:*** Moves diagonally, horizontally, or vertically.
- ***2 Rook:*** Moves horizontally or vertically.
- ***2 Bishop:*** Moves diagonally.
- ***2 Knight:*** Moves in an 'L-shape'.
- ***8 Pawn:*** Moves one square forward, but on its first move, it can move two squares forward.

Terms Associated: Stalemate; Checkmate; Gambit, Grandmaster (GM), Castling.

Associated Tournament: *FTX Crypto Cup.*

First woman GM: S. Vikayalakshmi.

Famous Players

- ***Viswanathan Anand:*** 5-time World Champion, *India's first GM (1988).* He is also the *1st recipient* of *Rajiv Gandhi Khel Ratna Award.*
- ***Dibyendu Barua:*** India's 2nd Grandmaster after Viswanathan Anand.
- ***R Praggnanandhaa:*** Young prodigy, reached 2023 FIDE World Cup final.
- ***Gukesh D:*** Among youngest Super Grandmasters, broke into world top 10
- Top women players: ***Koneru Humpy*** (*1st* Indian Grandmaster in *Women's Chess* to become *World Rapid Champion*); ***Tania Sachdev; Bhakti Kulkarni; R Vaishali.***
- ***Magnus Carlsen:*** Norwegian Chess Grandmaster.

The current World Chess Champion is Gukesh Dommaraju. He won the title by defeating Ding Liren in the 2024 World Chess Championship in Singapore. Gukesh became the youngest World Chess Champion ever at 18 years old.

Facts Associated with Chess

- *P. Harikrishna* was the first Indian to win the *Under-10 World Chess Championship* in *Menorca, Spain* in the year *1996.*

Sports	*No. of Players*
Basketball	5
Volleyball	6
Netball/Handball/Water Polo/Kabaddi	7
Korfball (male + female)	8
Baseball/Kho Kho	9
Football/Cricket/Hockey	11
Polo	4
Futsal	5
Ice Hockey	6

MISCELLANEOUS (One Liners)

- Archery has a target of 10 circles.
- Terms associated with Squash game (a racket sport): Let Ball; Stroke Ball; and No Let
- Famous players (Squash): Deepika Pallikal; Anahat Singh; Jahangir Khan (Pakistan).
- The most often described as gymnastics and dance on horseback is described as Equestrian vaulting. The term "dressage" is associated with this sport. Famous player: Divyakriti Singh.
- The first South Asian Federation Games was held in Kathmandu (1984).
- The Athletics Federation of India was formed in 1946.
- Netaji Subhas National Institute of Sports is situated in Patiala.
- Linthoi Chanambam is associated with Judo.
- The first Indian who won a bronze medal in World Athletics Championship is Anju Bobby George.
- The first Janjatiya Khel Mahotsav held in Odisha.
- The weight ofthe ball in handball for men is 425-475 gm.
- The US came out with the first 'official' compilation of volleyball rules and it was published by the YMCA.
- The equipment called antenna (colour: Red and White) used in Volleyball.
- The distance between the hurdles in 100 m women's hurdles in metres is 8.50 m.
- Dr Ajmer Singh (Arjuna Awardee) is associated with Athletics.
- Bhimrao Ambedkar Multipurpose Stadium situated in: Ayodhya (Uttar Pradesh).
- The first 4 sets in Volleyball are played to 25 points.
- Maharashtra has recognised Dahi Handi as a sports event.
- The National Sports University located in Manipur.
- India Winter Games started in 2020.
- The Nehru trophy boat race was organized by Kerala.
- The number of flights in a 110 m hurdle race is 10.
- Terms associated with Gymnastics: Pommel Horse, Roman Rings, Vaulting Table.
- Simone Biles; Dipa Karmakar (Tripura, India); Produnova are associated with Gymnastics.
- The First Field Handball World Championships were played in Germany (1938).
- Milkha Singh (Flying Sikh) is a famous track and field sprinter of India.
- The National Anti-Doping Bill, 2021 targets sports sector of India.
- The thickness of a wrestling mat should be between 5 and 7 cm.

- Formula 1 is an international level professional auto racing sport.
- Judo has its origin in the ancient Japanese art of Ju-jitsu.
- Lovely Choubey is a famous Indian sportswoman associated with Lawn Bowls sport.
- The age range for the Youth Boxer category is 17-18 years.
- The area of bout called a ring: Boxing.
- In AIBA Boxing Junior Boys and Girls Competitions, the bouts must consist of each round of2 mins.
- In all AIBA Boxing competitions, the rest time between each round is 1 min.
- The length of a Beach Volleyball court is: 16 m long and 8 m wide.
- In Triple Jump, white flag indicates trail is valid.
- In case of first false start in a running event, the athlete(s) shall be warned.
- The 1979 Asian Wrestling Championships organised by the Asian Associated Wrestling Committee (AAWC) for the first time held Jalandhar, India.
- "Trump" is a sports term used in card game Bridge.
- Ruia Gold Cup is associated with Bridge.
- Hima Das, nicknamed "Dhing Express" is an Indian sprinter from the state of Assam.
- Mallakhamb is traditional Indian sports game from the state of Madhya Pradesh.
- Baton is used in Relay Race, a Track and field event.
- In running events laps are counted by a lap scorer.
- The JRD Tata Sports Complex located in Jamshedpur, Jharkhand.
- Shot is the name of heavy spherical metal used in shot put Shot put ball weighs 7.26 Kg in men's competition and 4 Kg in women's competition.

Mallakhamb

- The European Champions Cup or Heineken Cup is associated with Rugby.
- Wilson Jones was India's first world champion in any sport after independence.
- The National Institute of Water Sports is in Goa.
- Pele, a soccer player holds the distinction (by any player) of having the most wins of the FIFA World Cup.
- The first Indian swimmer to swim across the English Channel (in 1958) was Mihir Sen.
- Terms associated with Golf: Birdie, eagle and albatross.
- Kambala is an annual buffalo race held in the state of Karnataka.
- The first para-athlete to receive the Rajiv Gandhi Khel Ratna was Devendra Jhajharia (Javelin thrower).
- Bhavani Devi is Indian sportsperson is associated with Fencing.
- Assam Riffles Public School in Shillong is the first Khelo India Sports school in North East India.
- Annu Rani is the first Indian woman to cross a distance of 60 m in Javelin throw.
- Sagol kangjei, an indigenous game of manipur is similar to the modern day sports of Polo.
- 'Tenpins' refers to the game of bowling.
- Mardani Khel, one of the famous martial art forms in India belongs to the state of Maharashtra.

UNITED NATIONS (UN)

- **Established:** *24 October 1945*
- **Headquarters:** *New York, USA*
- **Forerunner organisation:** *League of Nations* formed by *Treaty of Versailles, 1919*
- Formed at *UN Conference on International Organization, 1945*
- **Original Signatories:** *50 countries +1 (Poland signed later)*
- **Logo:** *Globe, olive branches*
- Term coined by *Franklin Roosevelt*
- **Secretary-General:** *António Guterres (Portugal)*
- **Total Countries:** *193*
- **Objective:** Maintain international peace and security, develop friendly relations among nations, and achieve international cooperation.

- **Official languages:** *Arabic, Chinese, English, French, Russian, Spanish*

Principal Organs Of The United Nations

1. UN GENERAL ASSEMBLY

- Includes *all UN Members*
- *Two-thirds majority* needed for major decisions, otherwise *a simple majority*
- Decisions *not binding* on UN members
- **Key functions:** Approves the UN budget, appoints the Secretary-General, makes recommendations through resolutions.

2. UN SECURITY COUNCIL

- **Total** *15 members*
- 5 Permanent Members (with veto power) are: *Britain, France, China, USA, Russia*
- *10 Non-Permanent Members* elected for a *two-year term.* (Originally 6)
- *India has been a member 8 times*
- *Japan:* elected as a non permanent member most number of times.

3. UN ECONOMIC and SOCIAL COUNCIL

- Promotes international economic and social cooperation
- *54 members elected for three-year terms.*

4. UN INTERNATIONAL COURT OF JUSTICE

- Judicial organ of the UN.
- Located in *The Hague, Netherlands*
- *15 Judges* elected for *9-year terms*
- Successor of *Permanent Court of International Justice (estd: 1920) under League of Nations*

5. UN TRUSTEESHIP COUNCIL

- Suspended on *1 Nov, 1994* with independence of Palau

6. UN SECRETARIAT

- Headed by the *Secretary-General* appointed for *5 year term.*
- Implements UN policies, administers peacekeeping operations, and prepares reports.

UN FUNDS AND PROGRAMMES

United Nations International Children's Fund (UNICEF

- **Established:** *11 December 1946*
- **Headquarters:** *New York, USA*
- **Objective:** Provide humanitarian aid to children worldwide.
- **Key Focus:** Child nutrition, education, immunization.

United Nations Environment Programme (UNEP)

- **Established:** *5 June 1972*
- **Headquarters:** *Nairobi, Kenya*
- **Founded by:** UN General Assembly (*at Stockholm Conference*)
- **UNEP + World Meteorological Organization = IPCC** in *1988 [IPCC-Inter Governmental Panel on Climate Change]*

Nations Development Programme (UNDP)

- **Established:** *1965*
- **Headquarters:** *New York*
- Important reports by UNDP are:
  - *Human Development Report*
  - *Gender Inequality Index*
  - *Global Multidimensional Poverty Index*
- **Key Focus:** poverty eradication, inclusive growth, reduce inequalities, achieve SDGs

United Nations Human Settlements Programme (UN-Habitat)

- **Established:** *1977*
- **Headquarters:** *Nairobi, Kenya*

World Food Programme (WFP)

- **Established:** *1961*

- **Headquarters:** *Rome, Italy*
- **WFP** won the *Nobel Peace Prize in 2020.*

Food and Agriculture Organisation (FAO) Twin Organisations.

- **Established:** *1945*
- **Headquarters:** *Rome, Italy*

United Nations Population Fund (UNFPA)

- **Established:** *1969*
- **Headquarters:** *New York*

United Nations High Commissioner For Refugees (UNHCR)

- **Established:** *1950*
- **Headquarters:** *Geneva, Switzerland*
- Provides support and protection to refugees worldwide.
- *Won the Nobel Peace Prize in 1954 and 1981*

International Civil Aviation Organization (ICAO)

- **Established:** *1947, Chicago Convention*
- **Headquarters:** *Montreal, Canada*

International Fund for Agricultural Development (IFAD)

- **Established:** *1977*
- **Headquarters:** *Rome, Italy*

OTHER SPECIALIZED AGENCIES OF THE UN

International Labour Organization (ILO)

- **Established:** *1919 (through the Treaty of Versailles)*
- **Headquarters:** *Geneva, Switzerland*
- Received *Nobel Peace Prize* in *1969.*

International Maritime Organization (IMO)

- **Established:** *1948*
- **Headquarters:** *London, UK*
- Focuses on maritime safety and environmental protection.

Established as Inter-Governmental Maritime Consultative Organization (IMCO) in 1948; became a specialized agency of the United Nations in 1959; renamed as International Maritime Organization in 1982.

International Monetary Fund (IMF)

- **Established:** *1944 (Bretton Woods Conference)*
- **Headquarters:** *Washington D.C., USA*
- Works to ensure global monetary cooperation and financial stability.
- Uses *SDR (Special Drawing Rights)* as its reserve asset/ currency
- **SDR- Basket of 5 currencies:** *US Dollar, Yen, Euro, Pound and Renmibi.*

IMF & World Bank are known as Twin Organisations.

World Bank

- **Established:** *1944* (Bretton Woods Conference)
- **Headquarters:** *Washington DC, USA*
- The World Bank is a group of following 5 institutions:
  - *IBRD (International Bank for Reconstruction and Development)*
  - *IDA (International Development Association)*
  - *IFC (International Finance Corporation)*
  - *MIGA (Multilateral Investment Guarantee Agency)*
  - *ICSID (International Centre of Settlement of Investment Disputes*

International Telecommunication Union (ITU)

- **Established:** *1865*
- **Headquarters:** *Geneva, Switzerland*
- Regulates international communication and radio frequencies.

United Nations Educational, Scientific and Cultural Organization (UNESCO)

- **Established:** *1945*
- **Headquarters:** *Paris, France*
- Promotes education, science, and cultural heritage protection.

United Nations Industrial Development Organization (UNIDO)

- **Established:** *1966*
- **Headquarters:** *Vienna, Austria*
- Supports industrial growth in developing nations.

World Health Organization (WHO)

- **Established:** *7 April 1948* **(celebrated as** *World Health Day***)**
- **Headquarters:** *Geneva, Switzerland*
- Works on global health initiatives, disease prevention, and medical research.

United Nations Conference on Trade and Development (UNCTAD)

- **Established:** *1964*
- **Headquarters:** *Geneva, Switzerland*
- Focuses on trade, investment, and development issues.

United Nations Office on Drugs and Crime (UNODC)

- **Established:** *1997*
- **Headquarters:** *Vienna, Austria*
- Works against drug trafficking, corruption, and international crime.

World Intellectual Property Organization (WIPO)

- **Established:** *1967*
- **Headquarters:** *Geneva, Switzerland*
- Releases Global Innovation Index alongwith *INSEAD, Cornell University*.

International Atomic Energy Agency (IAEA)

- **Established:** *1957*
- **Headquarters:** *Vienna, Austria*
- Promotes the peaceful use of nuclear energy and ensures nuclear safety.

United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)

- **Established:** *1947*
- **Headquarters:** *Bangkok, Thailand*
- Works on regional development, economic growth, and social issues in Asia-Pacific

World Trade Organization (WTO)

- **Established:** *1995* (through the Marrakesh Agreement, 1994)
- **Headquarters:** *Geneva, Switzerland*
- Regulates international trade between nations
- Replaced *GATT (General Agreement on Tariffs and Trade)*, established in *1948*.
- **GATT had** *23 member countries*, **WTO has** *166 member countries, currently*.
- **Current Director-General:** *Ngozi Okonjo-Iweala (Nigeria)*

REGIONAL ORGANISATIONS

South Asian Association for Regional Cooperation (SAARC)

- **Established:** *8 December 1985 (Dhaka, Bangladesh)*
- **Headquarters:** *Kathmandu, Nepal*
- Aims to promote economic and regional integration in South Asia.
- **Total Members:** *8 (Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, Maldives).*
- **Observers:** *9 countries*

Association of Southeast Asian Nations (ASEAN)

- **Established:** *8 August 1967 (Bangkok, Thailand)*
- **Headquarters:** *Jakarta, Indonesia*
- Focuses on political, economic, and security cooperation in Southeast Asia.
- **Members:** *10 (Malaysia, Brunei, Myanmar, Singapore, Thailand, Vietnam, Indonesia, Philippines, Laos, Cambodia)*

Bay of Bengal Initiative for Multi-Sectoral Technical & Economic Cooperation (BIMSTEC)

- **Established:** *1997 (Bangkok Declaration).*
- **Headquarters:** *Dhaka, Bangladesh*
- **Member Countries:** *7 (Bangladesh, India, Myanmar, SriLanka, Thailand, Nepal, Bhutan)*
- **1st BIMSTEC Youth Summit** was held in *Gandhinagar, Gujarat in February' 2025*

BRICS

- **Established:** *2009, Russia*
- **Member Countries:** *11*
- **Headquarters:** *Shanghai*
- **BRICS** is acronym where:
  - ***B:*** *Brazil*
  - ***R:*** *Russia*
  - ***I:*** *India*
  - ***C:*** *China*
  - ***S:*** *South Africa* (joined in 2010)
- **5 New Members Added in 2023-** *Saudi Arabia, Egypt, United Arab Emirates (UAE), Ethiopia, Iran, Indonesia (latest), making it BRICS+*
- While 6 countries were invited to join BRICS in 2023, only 5 joined, **Argentina declined the invitation in December 2023** after a change in government.

  So as of January 2025, BRICS has 11 members.
- *Fortaleza Agreement:* Signed on *2014*, in Fortaleza, Brazil, the agreement created *New Development Bank* to fund infrastructure and sustainable development projects in BRICS.
- *Contingent Reserve Arrangement (CRA)* is a $100 billion framework established in *2015*.

New Development Bank was established by BRICS countries in 2014, Headquarters: Shanghai, China.

The Asian Infrastructure Investment Bank (AIIB) HQ: Beijing

Shanghai Cooperation Organization (SCO)

- **Established:** *2001 (by China & Russia)*
- **Headquarters:** *Beijing, China*
- **Member Countries:** *10 : China, Russia, India, Pakistan (Joined in 2017), Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Iran, Belarus (joined in 2024)*

Regional Anti-Terrorist Structure (RATS)

- A Counter-Terrorism body under the ***Shanghai Cooperation Organization (SCO)***.
- **Established:** *2002*
- **Headquarters:** *Tashkent, Uzbekistan*
- **Member Countries:** *9 (As part of SCO)*

Asian Development Bank (ADB)

- **Established:** *1966*
- **Headquarters:** *Manila, Philippines*
- **Member Countries:** *69 (India is a founding member of ADB)*

  → India started availing of ADB's assistance in 1986.

European Union (EU)

- **Established:** *November 1, 1993 in Maastricht, Netherlands*
- **Headquarters:** *Brussels, Belgium*
- **Member Countries:** *27 (After Brexit in 2020)*
- **Awarded the** *Nobel Prize in 2012.*
- **Has a Eurozone where countries adopt the** *Euro as currency*
- **Total Eurozone Countries:** *20*
- **Latest Member:** *Croatia - Joined in 2023.*

> *The European Economic Community (EEC), a precursor to the European Union was established in 1958 through the Treaty of Rome.*

North Atlantic Treaty Organization (NATO)

- **Established:** *1949 (Through the North Atlantic Treaty)*
- **Member Countries:** *32*
- **Headquarters:** *Brussels, Belgium,*
- **Military Headquarters:** *Mons, Belgium*
- **Latest Member:** *Sweden (joined in March, 2024)*

Collective Security Treaty Organization (CSTO)

- **Established:** *After the USSR Disintegration in 1991*
- **Member Countries:** *6 (Armenia, Belarus, Kazakhstan, Kyrgyzstan, Russia, Tajikistan)*

International Solar Alliance (ISA)

- **Established:** *30 November, 2015 (Paris, France)*
- **Headquarters:** *Gurugram, Haryana*
- **Founding members:** *India & France*
- **Concept:** ***Proposed by*** Indian Prime Minister *Narendra Modi in 2015 at Wembley Stadium, UK*. He referred to Sunshine Countries as *"Suryaputra"(Sons of the Sun)*.
- **Launch Event:** *India Africa Summit*
- **Opened for signature in** *Marrakesh Morocco*.
- **Number of Member Countries:** *120+*
- **Present Director General:** *Ashish Khanna*

Group of Twenty (G20)

- **Established:** *1999*
- **Member Countries:** *21 (19 countries + European Union + African Union)*
- **Latest Member Joined:** *African Union, September 2023 (G20 India)*
- **Current Presidency (2024-25):** *Brazil*
- **Next Presidency (2025-26):** *South Africa*
- **Major Annual Event:** *G20 Leaders' Summit*
- G20 countries account for *85% of the world GDP and more than 2/3rd of the total world's population.*

G20 countries

G20 & G7 have no permanent secretariat/office.

G7 (Group of Seven).

- **Established:** *1975*
- **Members:** *Canada, France, Germany, Italy, Japan, United Kingdom (Britain) United States, and the European Union.* **(TRICK: BF JUICE)**
- EU participates but does not hold presidency.

G8 (Group of Eight)

- **Established:** *1997 (when Russia joined G7)*
- **Members:** *G7 + Russia*
- Dissolution: *Suspended in 2014* after Russia's annexation of Crimea, reverting back to G7.

Financial Action Task Force (FATF)

- **Established:** *1989 (Initiative of G7 Countries)*
- **Headquarters:** *Paris, France*
- Promotes effective implementation of legal measures to combat money laundering, terrorist financing etc.
- **Blacklist Countries:** *North Korea, Iran, and Myanmar*

International Criminal Police Organization (INTERPOL)

- **Established:** *1923*
- **Headquarters:** *Lyon, France*
- Provides a platform for law enforcement agencies to collaborate, even between countries without diplomatic relations.

Bharatpol

- Developed by the *Central Bureau of Investigation (CBI)*, this portal allows both central and state agencies to connect with *INTERPOL* for real-time information sharing.
- Replaces the previous system where only the CBI had direct access to INTERPOL

World Economic Forum (WEF)

- **Established:** *1971*
- **Headquarters:** *Cologny, Switzerland*

Important reports released by World Economic Forum -

1) Global Risks Report

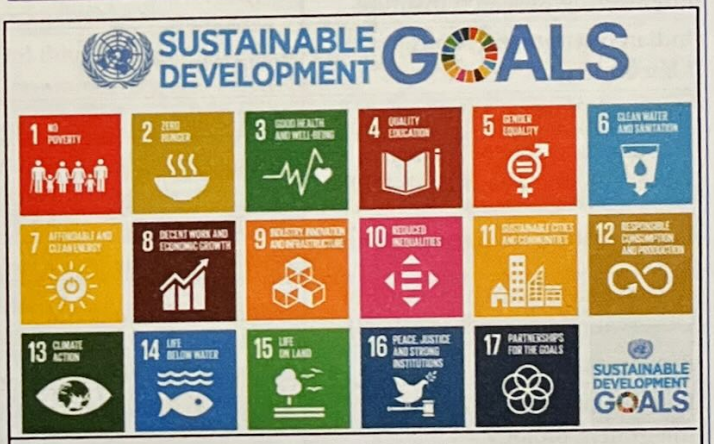
2) Global Competitiveness Report

3) Global Gender Gap Report

4) Global Travel and Tourism Report

5) Energy Transition Index

Organisations	*Headquarters*
Organization of the Petroleum Exporting Countries (OPEC)	Vienna, Austria
World Anti-DopingAgency (WADA)	Montreal, Canada
International Bureau of Weights and Measures (BIPM)	Saint-Cloud, France
World Meteorological Organisation (1950)	Geneva, Switzerland
Amnesty International (focused on Human Rights)	London



17 Sustainable Goals

NAME	LOCATION
SCIENCE AND RESEARCH INSTITUTES	
Council of Scientific & Industrial Research (CSIR)	*New Delhi*
Indian Academy of Sciences	*Bangalore, Karnataka*
Indian National Science Academy	*New Delhi*
Raman Research Institute	*Bangalore, Karnataka*
National Metallurgical Laboratory	*Jamshedpur, Jharkhand*
Central Mechanical Engineering Research Institute	*Durgapur, West Bengal*
Central Salt & Marine Chemicals Research Institute	*Bhavnagar, Gujarat*
Centre for Ecological Sciences	*Bangalore, Karnataka*
National Dope Testing Laboratory	*New Delhi*
Indian Institute of Astrophysics	*Bangalore, Karnataka*
Indian Statistical Institute	*Kolkata, West Bengal*
Tata Institute of Fundamental Research	*Mumbai, Maharashtra*
National Institute of Ocean Technology	*Chennai, Tamil Nadu*
National Environmental Engineering Research Institute	*Nagpur, Maharashtra*
Indian Institute of Tropical Meteorology	*Pune, Maharashtra*
National Physical Laboratory	*New Delhi*
National Institute of Science Education and Research (NISER)	*Bhubaneswar, Odisha*
Indian Institute of Geomagnetism	*Navi Mumbai, Maharashtra*
Aryabhatta Research Institute of Observational Sciences (ARIES)	*Nainital, Uttarakhand*
Bose Institute	*Kolkata, West Bengal*
Institute of Genomics and Integrative Biology	*New Delhi*
National Brain Research Centre	*Manesar, Haryana*
Indian Agricultural Research Institute	*New Delhi*
Central Sugarcane Research Institute (ICAR-Sugarcane Breeding Institute)	*Coimbatore, Tamil Nadu*
Indian Institute of Sugarcane Research	*Lucknow, Uttar Pradesh*
National Institute for Research on Commercial Agriculture	*Rajahmundry, Andhra Pradesh*
National Sugar Institute	*Kanpur, Uttar Pradesh*
National Dairy Research Institute	*Karnal, Haryana*
Central Leather Research Institute	*Chennai, Tamil Nadu*
Indian Institute of Soil Sciences	*Bhopal, Madhya Pradesh*
National Rice Research Institute	*Cuttack, Odisha*

NAME	LOCATION
Indian Institute of Horticulture Research	*Bengaluru, Karnataka*
Indian Institute of Spices Research	*Kozhikode (Calicut), Kerala*
Indian Institute of Maize Research	*Ludhiana, Punjab*
Indian Institute of Millets Research	*Hyderabad, Telangana*
Indian Institute of Oilseeds Research	*Hyderabad, Telangana*
Central Agroforestry Research Institute	*Jhansi, Uttar Pradesh*
Indian Veterinary Research Institute	*Izatnagar, Bareilly, Uttar Pradesh*
Indian Council of Agricultural Research (ICAR)	*New Delhi*
Central Institute for Cotton Research	*Nagpur, Maharashtra*
Central Institute of Fisheries Education	*Mumbai, Maharashtra*
Central Institute for Subtropical Horticulture	*Lucknow, Uttar Pradesh*
Indian Institute of Pulses Research	*Kanpur, Uttar Pradesh*
Indian Institute of Agricultural Biotechnology	*Ranchi, Jharkhand*
Central Arid Zone Research Institute (CAZRI)	*Jodhpur, Rajasthan*
Indian Grassland and Fodder Research Institute (IGFRI)	*Jhansi, Uttar Pradesh*
National Bureau of Plant Genetic Resuunes (NBPGR)	*New Delhi*
Central Tuber Crops Research Institute (CTCRI)	*Thiruvananthapuram, Kerala*
National Institute of Animal Biotechnology (NIAB)	*Hyderabad, Telangana*
Directorate of Rapeseed-Mustard Research	*Bharatpur, Rajasthan*
National Research Centre for Banana	*Tiruchirappalli, Tamil Nadu*
Spices Board of India	*Kochi, Kerala*
DEFENCE AND DEVELOPMENT RELATED INSTITUTES	
Defence Research and Development Organisation (DRDO)	*New Delhi*
Indian Space Research Organisation (ISRO)	*Bengaluru, Karnataka*
Border Roads Organisation (BRO)	*New Delhi*
Hindustan Aeronautics Limited (HAL)	*Bengaluru, Karnataka*
Bharat Electronics Limited (BEL)	*Bangalore, Karnataka*

NAME	LOCATION
Institute for Defence Studies and Analyses (IDSA)	*New Delhi*
Electronics Corporation of India Limited (ECIL)	*Hyderabad, Telangana*
National Highways Authority of India (NHAI)	*New Delhi*
MEDICAL AND HEALTH INSTITUTES	
All India Institute of Medical Sciences (AIIMS)	*New Delhi*
Central Drug Research Institute	*Lucknow, Uttar Pradesh*
Food Corporation of India	*New Delhi*
National Institute of Virology	*Pune, Maharashtra*
National Institute of Nutrition	*Hyderabad, Telangana*
Indian Council of Medical Research (ICMR)	*New Delhi*
Post Graduate Institute of Medical Education and Research (PGIMER)	*Chandigarh*
National Institute of Mental Health and Neurosciences (NIMHANS)	*Bengaluru, Karnataka*
Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER)	*Puducherry*
Central Institute of Psychiatry	*Ranchi, Jharkhand*
National AIDS Research Institute	*Pune, Maharashtra*
Rajiv Gandhi Centre for Biotechnology	*Thiruvananthapuram, Kerala*
ICMR-National Institute of Virology	*Pune, Maharashtra*
National Institute of Epidemiology	*Chennai, Tamil Nadu*
National Institute of Occupational Health	*Ahmedabad, Gujarat*
National Centre for Disease Control	*New Delhi*
National Institute of Immunology	*New Delhi,*
National Institute of Ayurveda	*Jaipur, Rajasthan*
OTHER IMPORTANT INSTITUTIONS	
National Institute of Fashion Technology (NIFT)	*New Delhi*
Indian Institute of Foreign Trade (IIFT)	*New Delhi*
National Institute of Design (NID)	*Ahmedabad, Gujarat*
Bureau of Indian Standards (BIS)	*New Delhi*
Indian Patent Office	*Kolkata, West Bengal*
Lalit Kala Akademi	*New Delhi*

NAME	LOCATION
Sangeet Natak Akademi	*New Delhi*
Sahitya Akademi	*New Delhi*
Archaeological Survey of India (ASI)	*New Delhi*
Press Council of India	*New Delhi*
Indian Museum	*Kolkata, West Bengal*
Indira Gandhi National Centre for the Arts (IGNCA)	*New Delhi*
Centre for Development of Advanced Computing (C-DAC)	*Pune, Maharashtra*
Centre for Cellular and Molecular Biology (CCMB)	*Hyderabad, Telangana*
National Archives of India	*New Delhi*
National Gallery of Modern Art	*New Delhi*
Central Forest Research Institute	*Dehradun, Uttarakhand*
Tagore Centre for study of Culture and Civilisation	*Shimla, Himachal Paradesh*
National Sample Survey Organization	*New Delhi*
National Institute of Mountaineering and Adventure Sports(NIMAS)	*Dirang, West Kameng, Arunachal Pradesh*
Atal Bihari Vajpayee Institute of Mountaineering and Allied Sports	*Manali, Himachal Pradesh*
Nehru Institute of mountaineering	*Uttarkashi, Uttarakhand*
Indian Institute of Tourism and Travel Management	*Gwalior, Madhya Pradesh*
Federation of Indian Chambers of Commerce and Industry (FICCI)	*New Delhi*
Food, Safety and Standard Authority of India, (FSSAI)	*New Delhi*
Netaji Subhash national Institute of sports ("Mecca of Indian Sports")	*Punjab*
Sports Authority of India (SAI)	*New Delhi*
Lakshmibai National Institute of Physical Education	*Gwalior, Madhya Pradesh*
Lakshmibai National College of Physical Education	*Thiruvananthapuram, Kerala*

CIVILIAN AWARDS

- India's Civilian Awards recognize outstanding contributions in various fields, including arts, literature, science, public service, and social work. These awards are announced *every year on Republic Day (26th January) and are conferred by the President of India at Rashtrapati Bhavan.*

1. Bharat Ratna (Highest Civilian Award)

- ***Eligibility: Any individual, irrespective of nationality.***
- ***Instituted in:*** *1954*
- ***Total recipients till date: 53 (as of 2024)***
- ***First recipient:*** *C. Rajagopalachari, Dr. S. Radhakrishnan, and Dr. C.V. Raman (1954)*
- ***First female recipient:*** *Indira Gandhi (1971)*
- ***First posthumous recipient:*** *Lal Bahadur Shastri (1966)*
- ***First sportsperson recipient:*** *Sachin Tendulkar (2014)* (Also the Youngest recipient: at age 40)
- ***Non-Indian recipients:*** *Khan Abdul Ghaffar Khan (1987), Nelson Mandela (1990)*

Bharat Ratna Awardees for 2024:

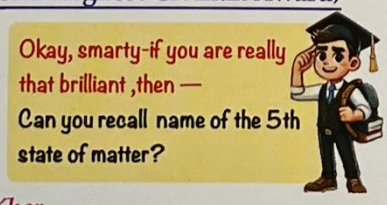
Name	*Field of Service*
Karpoori Thakur (Posthumous)	Public Affairs (Politics)
M.S. Swaminathan (Posthumous)	Science & Engineering (Agriculture)
P.V. Narasimha Rao (Posthumous)	Public Affairs (Politics)
L.K. Advani	Public Affairs (Politics)
Chaudhary Charan Singh (Posthumous)	Public Affairs (Politics)

2. Padma Awards

- ***Instituted in:*** *1954*
- Fields covered: Arts, literature, education, science, industry, sports, medicine, social work, and public affairs.

i. Padma Vibhushan (Second-Highest Civilian Award)

- *First recipients:*
- *Satyendra Nath Bose*
- *Nandalal Bose*
- *Zakir Hussain*
- *Balasaheb Gangadhar Kher*
- *V.K. Krishna Menon*
- *Jigme Dorji Wangchuk*



Padma Vibhushan Awardees for 2025:

Name	*Field of Service*	*State*
Dr. D. Nageshwar Reddy	Medicine	Telangana
Justice (Retd.) Jagdish Singh Khehar	Public Affairs	Chandigarh
Smt. Kumudini Rajnikant Lakhia	Art	Gujarat
Shri Lakshminarayana Subramaniam	Art	Karnataka
Shri M. T. Vasudevan Nair (Posthumous)	Literature and Education	Kerala
Shri Osamu Suzuki (Posthumous)	Trade and Industry	Japan
Smt. Sharda Sinha (Posthumous)	Art	Bihar

ii. Padma Bhushan (Third-Highest Civilian Award)

First recipients (1954)-

- *V.K. Krishna Menon* - ***Public Affairs***
- *Homi J. Bhabha* - ***Science & Engineering***
- *Shanti Swaroop Bhatnagar*- ***Science & Engineering***
- *Mahadeva Iyer Subramania Iyer*- ***Civil Service***
- *M.S. Subbulakshmi* - ***Arts (Music) [first female recipient]***

iii. Padma Shri (Fourth-Highest Civilian Award)

GALLANTRY AWARDS

India's Gallantry Awards are presented to military personnel and civilians *for acts of bravery and valor in the face of extreme danger.* These awards are divided into wartime gallantry awards and peacetime gallantry awards.

1. Wartime Gallantry Awards

Param Vir Chakra *(Highest Wartime Gallantry Award)*
Mahavir Chakra *(Second-Highest)*
Vir Chakra *(Third-Highest)*

2. Peacetime Gallantry Awards

Ashoka Chakra *(Highest Peacetime Gallantry Award)*
Kirti Chakra *(Second-Highest)*
Shaurya Chakra *(Third-Highest)*

SPORTS AWARDS

India's Sports Awards recognize excellence in various sporting disciplines. These awards are presented annually by the President of India to honor outstanding achievements in sports and games.

1. Major Dhyan Chand Khel Ratna Award (Highest Sporting Honour)

- *Instituted: 1991-92*
- *₹25 Lakhs awarded by Mo Youth Affairs & Sports to each recipient.*
- *First Recipient: Viswanathan Anand (Chess) - 1991-92*

> In August 2021, Rajiv Gandhi Khel Ratna Award got renamed to Major Dhyan Chand Khel Ratna Award.

Khel Ratna Awardees for 2024:

Sports	Name
Chess	Gukesh D
Hockey	Harmanpreet Singh
Para-Athletics	Praveen Kumar
Shooting	Manu Bhaker

2. Arjuna Award (Second highest Sporting honour)

Arjuna Award

- *Instituted: 1961*
- *15 Lakh given to recipients.*
- *First Recipients (1961):*
  P.G. Sethi - Golf
  Bajarangi Prasad - Swimming
  Karni Singh - Shooting
  Krishna Das - Archery
  Udey Chand -Wrestling
  P.K. Banerjee - Football
  Kumari Ann Lumsden- Hockey
  Salim Durani - Cricket
  Gurbachan Singh Randhawa - Athletics

> 1st Woman to get Arjuna Award: Meena Shah (1962) for Badminton.
> 1st Arjuna Award recipient for Kabaddi: Sahanand Mahadev Shetty (1972)

Arjuna Awardees, 2024:

Sports	Name
Athletics	Jyothi Yarraji Annu Rani
Boxing	Nitu Ghangas Saweety Boora
Chess	Vantika Agarwal
Hockey	Salima Tete Abhishek Sanjay Jarmanpreet Singh Sukhjeet Singh
Para-Archery	Rakesh Kumar
Para-Athletics	Preeti Pal Jeevanji Deepthi Ajeet Singh Dharambir Sachin Sarjerao Khilari H. Hokato Sema Pranav Soorma Simran Navdeep Singh
Para-Badminton	Nitesh Kumar Thulasimathi Murugesan Nithya Sre Sumathy Sivan Manisha Ramadass
Para-Judo	Kapil Parmar
Para-Shooting	Mona Agarwal Rubina Francis
Shooting	Swapnil Kusale Sarabjot Singh
Squash	Abhay Singh
Swimming	Sajan Prakash
Wrestling	Aman Sehrawat

Arjuna Lifetime Achievement Awardee, 2024:

Athletics	Sucha Singh
Para-Swimming	Murlikant Rajaram Petkar

3. Dronacharya Award

Given to *coaches* for producing outstanding sportspersons at the international level.

- *Instituted: 1985*
- *First Recipients (1985): Bhalchandra Bhaskar Bhagwat (Wrestling), O.M. Nambiar (Athletics), Om Prakash Bharadwaj (Boxing)*
- *First female recipient:*
  Hansa Sharma (Wrestling) in 2000.

Dronacharya Awardees for 2024:

	Sports	Name
Regular Category	Para-Shooting	Subhash Rana
	Shooting	Deepali Deshpande
	Hockey	Sandeep Sangwan
Lifetime Category	Badminton	S Muralidharan
	Football	Armando Colaco

4. Dhyan Chand Award *(or Dhyan Chand Award for Lifetime Achievement Award in Sports & Games)*

Given to *retired sportspersons* for their lifetime contribution to sports.

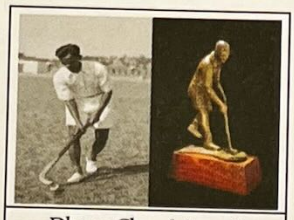
Instituted: 2002

First Recipients:

Shahuraj Birajdar **(Boxing),**

Ashok Diwan **(Hockey),**

Aparna Ghosh **(Basketball)**



Dhyan Chand Award

LITERARY AWARDS

1. Jnanpith Award (Highest Literary Award)

Given to writers for their literary excellence in any of *the 22 languages of India as listed in 8th Schedule of the Constitution of India.*

- *Given by: The Bhartiya Jnanpith,*
- *Prize amount of Rs. 11 lakhs, a citation and a bronze replica of Goddess Saraswati is awarded.*
- *Instituted in: 1961*
- *First Recipient (1965): G. Sankara Kurup* for *Odakkuzhal (Malayalam)* which means *The Bamboo Flute*, published in *1950*
- *First female Recipient (1976): Ashapoorana Devi* for her novel *Pratham Pratishruti.*
- *59th Jnanpith Awardee (2024): Vinod Kumar Shukla*
- *Damodar Mauzo*, the **first Indian writer in English** won the *57th Jnanpith* Award.

2. Sahitya Akademi Award

Given to writers for their literary excellence in one of *the 24 recognised Indian languages including English and Hindi.*

- *Instituted: 1954*
- *First Recipient in Hindi Category, 1955: Makhan Lal Chaturvedi* for *"Him-Tarangini" (poetry)*
- *First Recipient in English Category, 1960: R.K. Narayan* for his novel *"The Guide"*

3. Saraswati Samman

Annual award for outstanding literary works published in any of India's *22 official languages*, listed in 8th Schedule of the Constitution of India.

- *Instituted: 1991*
- *Given by: K.K. Birla Foundation*
- *First Recipient: Harivansh Rai Bachchan (Hindi) - 1991*

4. Vyas Samman

Annual award given for outstanding literary works in *Hindi.*

- *Instituted: 1991*
- *Given by: K.K. Birla Foundation*
- *First Recipient: 1991 - Ram Vilas Sharma* for his book *"Bharat ke Pracheen Bhasha Parivar aur Hindi"*

5. Kalidas Samman

- *Awarded by: Government of Madhya Pradesh*
- *Fields Covered:* Classical Music, Classical Dance, Theatre, Fine Arts
- *Instituted in: 1980*
- *Named After: Classical Sanskrit poet Kalidasa*
- *First Recipient (1980): Semmangudi Srinivasa Iyer and Mallikarjun Mansur*
- *First Female Recipient: M. S. Subbulakshmi - Classical Music (1988)*

Latest Awardees (2023-24):

- Pandit Uday Bhawalkar - classical music
- Raghupathi Bhat - for reviving the Ganjifa miniature paintings

FILMS AND ENTERTAINMENT AWARDS

1. Dadasaheb Phalke Award (Highest Film Honour)

For Lifetime contribution to Indian cinema.

- *First Recipient: Devika Rani (1969)*
- *Dadasaheb Phalke Awardee for 2024- Mithun Chakraborty*

2. National Film Awards

70th National Film Awards, 2024:

- *Best Feature Film: Aattam (The Play)*
- *Best Hindi Film: Gulmohar*
- *Best Animation Film: Brahmastra: Part 1 - Shiva*
- *Best Actor: Rishabh Shetty- Kantara*
- *Best Actress: Nithya Menen (Thiruchitrambalam), Mansi Parekh (Kutch Express)*
- *Best Popular Film Providing Wholesome Entertainment: Kantara*
- *Best Director: Sooraj R. Barjatya - Uunchai*
- *Best Supporting Actress: Neena Gupta- Uunchai*
- *Best Supporting Actor: Pavan Malhotra- Fouja*

3. Filmfare Awards

Filmfare Awards 2024 :

- *Best Film: 12th Fail*
- *Best Actor: Ranbir Kapoor - Animal*
- *Best Actress: Alia Bhatt - Rocky Aur Rani Ki Prem Kahani*
- *Best Director: Vidhu Vinod Chopra - 12th Fail*

GLOBAL AWARDS

1. Nobel Prize

- *Instituted:* 1901 by *the Nobel Foundation (Sweden/ Norway)*
- *6 Categories:* **Peace, Literature, Physics, Chemistry, Medicine, Economics**

> **Nobel prize is given in the memory of Alfred Nobel (discoverer of Dynamite)**

- All Nobel prize is awarded in Stockholm, Sweden while Nobel Peace Prize is awarded in Oslo, Norway.

First Recipient:

- *Wilhelm Conrad Röntgen (Physics, 1901) - for the discovery of X-rays.*

First female recipient:

- *Marie Curie (1903) - Only woman to win 2 Nobel :*
  - — Shared *1st Nobel* with her husband *Pierre Curie & Henri Becquerel.*
  - — Won *2nd Nobel in 1911* for the discovery *of Radium & Polonium.*

First Indian Recipient:

- *Rabindranath Tagore (Literature) 1913 for Geetanjali.*

Other Indian Recipients:

C.V. Raman – Physics, 1930

Mother Teresa – Peace, 1979

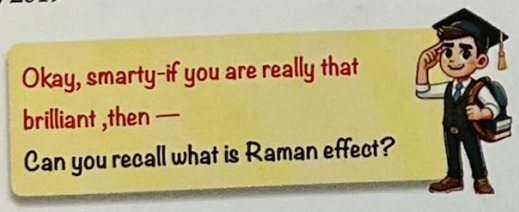
Amartya Sen – Economic Sciences, 1998

Venkatraman Ramakrishnan – Chemistry, 2009

Kailash Satyarthi – Peace (for struggle against child labour), 2014

Abhijit Banerjee – Economic Sciences (work in poverty alleviation), 2019

> **Abel Prize is considered as Nobel Prize of Maths.**



> ***Nobel Prize for Economics* was established in 1968 by Sweden's Central Bank.**
>
> **Originally known as Sveriges Riksbank Prize in Economic Sciences.**

2. Ramon Magsaysay Award

Named after **Ramon Magsaysay, former President of Philippines** (known for integrity and public service)

Instituted: 1957 by the **Rockefeller Brothers Fund** (Philippines)

- *First Recipient:* *Wu San Lien* (Public Service, 1958)
- *First Indian Recipient:* *Acharya Vinoba Bhave*, 1958

Other Indian Recipients:

Kiran Bedi – Government Service, 1994

Aruna Roy – Community Leadership, 2000

Bezwada Wilson – Emergent Leadership, 2016

Ravish Kumar – Ethical Journalism, 2019

Dr. Ravi Kannan – Public service in medical field, 2023

Ravish Kumar

3. Booker Prize

- *Instituted:* 1969 *(UK)*
- For Best original novel written in English and published in the UK or Ireland.
- *First Recipient:* *P.H. Newby- Something to Answer For, 1969*
- *First Indian Recipient:* *Arundhati Roy* - The God ofSmall Things, 1997

Other Indian Recipients:

Kiran Desai - The Inheritance of Loss, 2006

Aravind Adiga - The White Tiger, 2008

Geetanjali Shree - Tomb of Sand (International Booker), 2022

> ***Note:** The International Booker Prize is awarded for a book translated into English and shared between the author and the translator.*

4. Pulitzer Prize

- *Instituted:* 1917 *by the will of Joseph Pulitzer (USA)*
- *Awarded by:* *Columbia University, New York*
- *Categories:* Journalism, Literature, Drama, Music, etc.
- *First Recipient:* *Herbert Bayard Swope* (Reporting, 1917)
- *First Indian Recipient:* *Gobind Behari Lal - Journalism* (Science Reporting), 1937

Other Indian Recipients:

→*Jhumpa Lahiri* - Interpreter of Maladies (Fiction), 2000

→*Geeta Anand* - Wall Street Journal investigative reporting, 2003

→*Siddhartha Mukherjee* - The Emperor of All Maladies (General Nonfiction), 2011

→*Indian Staff of Reuters* - Photography, 2020 (for coverage of protests in Hong Kong)

5. **OSCAR Awards -**

(Also known as The Academy Awards)

- *Instituted in: 1929*
- *First Recipient: Emil Jannings (Best Actor) & Janet Gaynor (Best Actress)*
- *First Indian Recipient: Bhanu Athaiya (Best Costume Design, Gandhi 1983)*
- *Satyajit Ray is the first Indian to receive an Honorary Oscar (1992)*
- *A. R. Rahman is the first Indian to win two Oscars in the same year (2009)*
- *The Elephant Whisperers (2023) was India's first win in the Documentary Short Film Category*

Oscar Awards 2025 Winners:

- *Best Picture: Anora*
- *Best Director: Sean Baker (Anora)*
- *Best Actor: Adrien Brody (The Brutalist)*
- *Best Actress: Mikey Madison (Anora)*
- *Best Supporting Actor: Kieran Culkin (A Real Pain)*
- *Best Supporting Actress: Zoe Saldana (Emilia Perez)*
- *Best Animated Feature: Flow*
- *Best International Feature Film: I'm Still Here*
- *Best Original Screenplay: Anora*
- *Best Adapted Screenplay: Conclave*

Emmy awards are given in Television Industry and Grammy Awards are given in Music Industry